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AIR-BORNE SEALING

THE problem of building a gas-tight vessel 25 feet high by sometimes as much as 8 feet wide out of relatively small bricks with jointing material which cannot have in the nature of things any great adhesive power—a long high wall not more than 3½ in. or 4 in. thick—and keeping it gas-tight, even though the pressure differential is measured in nothing higher than tenths of an inch water pressure, while it is being dried out (and the water content of the green wall is by no means negligible) and heated up to carbonizing temperatures, during which its linear dimensions will increase by at least 1% (*i.e.*, 3 in. in height)—and, further, while it is being subject to all the intensive chemical and physical activities of the gas-making process over a period of years—is indeed a formidable one. In the new retort cracks are inevitable. Neglected cracks lead to gaping holes and to early collapse. No wonder then that retort-house operators have exhausted their ingenuity in hot-patching, cold-patching, spraying, welding, and all the other practices which have been more or less successful, until suddenly there appears an idea—not indeed new; it was postulated 40 years ago—but an idea which if it could only be endowed with practicability would be an "elegant" solution to the problem. Dr. Haffner used *le mot juste* in his contribution to the discussion of Mr. Bird's Paper, which we published in the "JOURNAL" last week. We give a report of the discussion in our issue to-day. We exclaim with Mr. A. T. Green: Why didn't we think of it before?

The kernel—the pith and marrow—of this first practical and successful advance in powder-sealing lies in the preparation of the powder. No doubt this is itself a delicate and laborious process, and one which demands research and experiment to place it on a sound rational basis. The method appears to be simplicity itself. You just seal up your retort at both ends. If air is now blown in it will flow out through any cracks in the retort walls. Load the air with dust and the dust should be deposited in the cracks. These will fill up until the outward flow is stopped. The progress of the process will be indicated by rising pressure in the retort. But it is just in these simple matters that little things count.

The particle size must obviously be fine enough for the powder to remain for a long period in suspension in the air, and yet coarse enough to settle out when velocity is checked through the crack, but not coarse enough to be thrown down to any great extent within the retort. That is the physical side of it—or some of the physical side. The chemical side is perhaps similar to that of jointing materials in general, refractoriness of the right grade, composition such as not to flux too much or to have any deleterious effect whatever on the material of the retort wall. There is also the interaction between the physical and the chemical, since the powder can be no more homogeneous than refractories are generally—which means that there will be the difficulty (we do not yet know how it has been so far overcome) that the individual particles are not likely to be similar in size and weight, and dissimilarity involves harmful segregation. It may well be that, as Mr. A. T. Green says, "the type of powder to be used in the early stages would be different from that used for the later stages." May it not be that different powders might be more effective in different zones of the retort? Already one practitioner has been using iron cement powder to fill cracks in his castings (was this air-borne?).

That a considerable measure of success has already attended this "elegant" process is evident from the testimony rendered by those who have tried it—on horizontal as well as vertical retorts. A process which for an expenditure of £250 per annum will save 90,000 therms is one to command respect. But a process which will enable retorts to be kept tight without lowering their temperature and without requiring them to be out of service for more than an hour or so in three months is one that demands the full attention of our research organization, especially as the Director already encourages the view that retort life must be considerably prolonged. In any case the process will be welcomed, if for no other reason, because it replaces in these days of difficult labour conditions arduous manual operations performed in discomfort by a technical process which within its limitations must be effective.

APPLICATION OF ATOMIC ENERGY

FOR several years we have been interested scientifically in the release of atomic energy—for several years prior to the devastating results wrought by the atomic bombs dropped on Japan towards the culmination of the last world war. That during the war years enormous progress in this direction has been made is obvious to everybody, and scientific interest has become part only of a general interest incorporating many major questions of the effects on the future of the discoveries which have been made—social influences as they affect world civilization and possible revolutions in industrial practice. The whole question is of extreme magnitude, and can, looked at from many angles, be rightly described as fearsome; but the fact remains that the progress of science, though it may be channelled, cannot be stemmed, and the point at issue before civilization at the moment seems to us to be how best to channel future development in the release of atomic energy which may well herald a new era. Following the use of atomic energy to end the war, we published in the "JOURNAL" last year a series of four articles discussing some of the researches which had led up to its practical application, some of the principles involved, and some of the possibilities which may lie ahead. Among these possibilities was the use of atomic energy via suitable media for the raising of steam for, in its turn, the generation of electricity, and only last month we referred in our columns to what we considered an important Paper given by Professor Sir Charles D. Ellis, Scientific Adviser to the Army Council, on the question of when it may be possible to apply to industry the results of research into the fission of the atom. Our reference was in the "JOURNAL" of April 3, page 550, and there is no need for us now to reiterate the suggestions of Sir Charles Ellis, except to recall his contention that in time we are going to have atomic furnaces; that they will be of tremendous importance in the location of industry; and that they will make a noticeable difference to our total power resources. We would emphasize that he added that we shall have to wait a considerable time before any of these advantages can be enjoyed.

While we have said that the progress of science cannot be stemmed—and we think it should not be stemmed—we would say once again that like everybody else we are deeply concerned regarding how atomic power should be used, for it can be used either beneficially or detrimentally. We turn anew to the subject in the light of a very important document issued by the American State Department on the problem of rendering this new scientific mastery of nuclear fission safe for the world. This document is a report of a Committee headed by the Assistant Secretary of State of the United States Government, and consisting of five men, four of whom are technical experts of the highest authority on the subject under review. The Chairman was Mr. David E. Lilenthal, who is Chairman of the Tennessee Valley Authority. In their report the Committee point out that the indispensable material for the release of nuclear energy is the uranium isotope 235, and that this isotope if de-naturized is fully adequate for industrial use, though it

becomes useless for the manufacture of explosives, and that those scientists who require the pure element as an instrument of research can well be content with quantities too small to tempt the military aggressor. Consequently it would be technically possible to divide the range of atomic operations into safe and dangerous classes, and to reserve the latter to a proposed international authority.

The idea is that an atomic development authority should be invested with the exclusive right to mine uranium, to distribute the de-natured variety, and to control dangerous processes. On this report an extraordinarily interesting article appeared in *The Times* of April 20, an article in which *The Times* scientific correspondent raised the query as to what were the social as distinct from the warlike uses of nuclear energy. He remarked that the development of power installations—for instance the generation of electricity from steam produced by the heat of nuclear reactions—is an obvious objective; but he added that it does not follow that the power, even after considerable further research and experience, is likely to be particularly cheap, for it is doubtful whether the materials will be easy to prepare, and in any case the cost of fuel is a comparatively small part of the cost of generating electricity. He went on to say, however, that the easy transfer of atomic "fuel" may offer advantages in certain cases, one pound of uranium being capable of producing the same heat as 10 tons of coal. In point of fact, according to Einstein's conclusion that mass and energy are equivalent, one pound weight of any kind of matter is equivalent to the whole energy derived from Niagara Falls in well over a year. At present, however, there is no prospect that we shall be able to derive energy of this magnitude from the total abolition of a mass. We have mentioned the de-naturing of uranium 235, to which we would add plutonium, in which process the materials are closely mixed with some inert substance slowing up the reaction sufficiently to render them useless for explosive purposes, but not so as to spoil their uses for peaceful purposes. An important point is that to remove the de-naturing substance is a difficult process involving large installations.

With the object of fostering beneficial development and national research on nuclear processes, the proposed atomic development association, it is suggested, should supply de-naturing uranium 235 and plutonium to national organizations, and should license the construction of piles and reactors of certain types for the production of power and for the production of artificial radioactive elements and other agents of research. The conclusion is arrived at that, through the control of the primary materials, the atomic development association would have close hold on atomic work in individual countries with a minimum of interference.

Prospects of Cheaper Gas

As foreshadowed by Mr. A. E. Sylvester, Governor and Managing Director, at the annual meeting in February, the Gas Light and Coke Company has announced that it is seeking statutory powers to reduce the price of gas, and that the new prices will be published as soon as these powers have been obtained. There is no indication as to how the prices are to be revised, but in February it was stated that the improved position gave the Company the opportunity of bringing into force a new method of charge which it was believed would be fairer to consumers. Hence it was hoped to introduce a simple block rate, of which the first small block would be at the existing rate and subsequent blocks at lower rates. Some 73% of the domestic consumers use slot meters, and it was proposed that the supplement, which was 2d. per therm in the major part of the area, and which had been charged on all the gas used, should be curtailed by charging it on a limited number of therms in each year.

The official announcement with regard to price reduction is accompanied by a statement that the Company has planned a vast programme of expenditure on its 13 works in the London area. This work will take about five years if materials and labour are available, and the total cost will run into several million pounds. During the war normal replacements were impossible, and the gas-making plant could not be given the maintenance required to keep it in full working order. This, combined with the widespread effects of enemy bombing and a great shortage of skilled craftsmen, made the gas supply situation very difficult at the end of 1945 and the beginning of this year. The next five years will see the introduction of a high proportion of new gas-making plant, making possible an increased efficiency in using coal. One-third of the Company's gasholders were put out of use by bombing, and these are still out of action.

Rehabilitation

One of the most important problems arising out of demobilization is that of providing means for helping returned workers to recover their old skill in the shortest possible time, and the manner in which the problem has been approached by the Bournemouth Gas and Water Company is worthy of mention. By the end of March nearly 250 men had returned to work, and although this still left a considerable deficit, there are hopes that the full complement will be back for next winter's heavy demands. The April *Co-Partner* tells how the Company was able to get off with a flying start, largely due to the fact that before the war it had its own training organization for the different departments. It was realized that schemes of rehabilitation must cater for many classes, for example, (A) Craftsmen: Fully trained men needing only a short period of intensive revision; young men called up before completing their apprenticeship; and newcomers who were called up with little or no technical training, and who cannot now be expected to serve a full five years' apprenticeship; (B) Technicians in the three classes mentioned, who normally become technical assistants in gas manufacture and gas supply, and who have to pass the higher examinations of the Institution of Gas Engineers before becoming "qualified" technicians.

With regard to the training of gasfitters, as the men have returned they have attended training classes at the Bourne Valley works under the Company's own instructors, supplemented by special classes at the Bournemouth Technical College. Opportunity is also offered for these men to attend lectures by representatives of leading manufacturers of gas appliances. The position of junior technical staffs was more difficult because there are only a small number of these in a gas undertaking. Training of such men requires the time of senior officials of the Company, and these could not be spared as whole-time instructors when the Company is so short of staff. Technical institutions were unable to say what classes could be arranged until they knew that students would be available in sufficient numbers, while the Ministry of Labour were unable to say how many students would attend until they knew what training facilities would be available. With a view to overcoming this impasse, the Bournemouth Company approached the Principal of the Bournemouth Technical College, and arrangements were made to utilize the existing day and evening classes at the College for two or three men who had returned, and for them to be given training in gas engineering subjects by part-time instructors from the Company's staff. These arrangements were the forerunner of the intensive courses for gas engineers under the auspices of the Institution and the Ministry of Education now being attended by young gas engineers from all over the country. The scheme adopted by the Bournemouth Company is working well, and the men who have returned to work are eagerly availing themselves of the opportunity to fit themselves for advancement. Six years' absence means that there is a lot of leeway to make up.

Why No Houses?

We have received with the compliments of Major H. E. Crawfurd, Chairman of Aims of Industry, a copy of an 8-page pamphlet comprising a statement on the housing problem by Sir Harry R. Selley, President of the Federation of Master Builders, which aims at throwing light on some of the reasons for the continuing house shortage and the delay in the provision of homes for the people. Claiming encouragement for private enterprise, which he says is clearly being treated unfairly, Sir Harry quotes statistics indicating that between 1919 and 1939 a total of 1,112,544 houses were provided by local authority building assisted and unassisted, and 2,885,822 in the case of assisted and unassisted private enterprise. These figures refer only to small houses, namely those of a rateable value of not more than £78 in the provinces and £105 in the Metropolitan area.

The statement asserts that on the question of the availability of land it cannot be claimed that this is obstructing progress. There is, it says, enough labour to make a good start, the bricks are there to be released, and the cement works of the country could adequately supply the building needs. In the case of component parts for houses, such as baths, gas stoves, and cookers, which are essential for complete building operations, the position "is in a state of utter muddle. The reason is that the Government will not make use of the existing sources of supply, and turn the cold shoulder to the firms who make these things. Ever faithful to bureaucracy they must needs set up in these urgent times their own organization, and the result

is red tape, and hot air, but few component parts." As far as the supply of all materials is concerned, the Government insist on this being done through several Government Departments, which cannot fail to cause delays. The whole process of delivery could, it is argued, be speeded up if the Government would allow the builders to order their requirements direct from the merchanting and distributing firms who are there ready to do the work.

Personal

Mr. JAMES A. MACLAY, ironfounder, Glasgow, who died on Feb. 26, left £250 to the Benevolent Fund of the Institution of Gas Engineers, and £100 to the Benevolent Fund of the North British Association of Gas Engineers.

* * *

For the last five years Manager of the Gorebridge Gas Light Company, Mr. THOMAS HAXTON has been appointed Manager of the Aberlady and Gullane Gas Company. A native of Dunfermline, he was with the Cowdenbeath Gas Company before going to Gorebridge.

* * *

After 43 years' service with the Gloucester Gas Light Company, Mr. W. E. TEW, Works Manager for the past 10 years, has retired. Mr. P. J. PURNELL, Assistant Works Manager, has been appointed to succeed Mr. Tew.

* * *

Dr. N. BOOTH, Principal Scientific Officer to the Gas Research Board, has been appointed Research Manager to the British Oxygen Company. Before joining the Gas Research Board in February, 1944, Dr. Booth had been on the staff of the Fuel Research Station for 13 years.

* * *

Mr. C. J. DOUGHERTY has resigned his position as Chief Engineer to the York, Harrogate, and District Group of Gas Companies, and has been appointed Chief Engineer to the Auckland Gas Company, New Zealand. He hopes to take up his new appointment early in July.

Obituary

Mrs. Cloudesley Brereton

It was my good fortune to meet Mrs. Cloudesley Brereton as long ago as 1912, and to have enjoyed her friendship ever since. Her death closes an epoch in gas history, and it is due to her memory that she should be held in high esteem in the Industry whose best interests she did so much to foster. Mrs. Brereton and Sir Francis Goodenough formed an historic partnership. He was the enthusiast for gas, with an intimate knowledge of the Industry and a high conception of its value as a public service, while Mrs. Brereton was a brilliant woman, whose long devotion to public health and hygiene led her to look upon gas as a solution of many problems in those fields and worthy of her support.

Together these two created the British Commercial Gas Association, and what might have been merely a live and valuable organization for the promotion of gas sales became much more than that, owing to the qualities and viewpoint which Mrs. Brereton brought to its service. The Association was animated by a Crusader spirit which profoundly influenced the minds and practice of the gas administrators of that date, and all its products in advertisement and publicity were of a quality as regards taste and literary excellence which gained for it a unique reputation in its field. The B.C.G.A. was not merely a trade organization, it was a vitalizing force and a source of inspiration.

Mrs. Brereton regarded the Gas Industry as an instrument for good in the national life, and was little concerned with business or profit making considerations. This basic viewpoint possessed her mind, and gave to everything she did or wrote for the B.C.G.A. its peculiar sincerity and compelling power. Her knowledge of literature and her own literary attainment were of a high order, and she was as fertile in ideas as she was capable of expressing them. She placed these abilities without reserve at the disposal of the Gas Industry and its leaders in a most self-effacing manner, which sometimes caused her to miss the recognition which was her due. In the minds and hearts of those who were privileged to know Mrs. Cloudesley Brereton and her work her memory is safely enshrined, and it is well that those who have not had that experience should know what an exceptional woman she was, and what splendid work she did for the Gas Industry.—H. E. BLOOR.

* * *

Mr. R. M'NAB, whose death in his 69th year has occurred at Larbert, was, until his retirement seven months ago, cashier with Messrs. R. & A. Main, Ltd., Gothic Foundry, Camelon. Mr. M'Nab had served the firm for some 40 years.

The British Tar Confederation has transferred its offices to Artillery House, Artillery Row, London, S.W. 1 (Telephone, Abbey 3731/32). Mr. Ralph Alsop has been appointed a Vice-Chairman of the Executive Board.

Letters to the Editor

Nationalization and the Gas Industry

DEAR SIR,—On Feb. 8, 1946, acting on the instructions of my Board, a letter was sent to the British Gas Council informing them that the Directors profoundly disagreed with the approach of the Chairman and the Executive Board to the Government's nationalization proposals; that, in their opinion, the Council have no right either to speak for the Industry or to compromise them on broad matters of principle vitally affecting their existence, without first consulting the general body of members; and that the proper attitude to have adopted to the uncompromising position taken up by the Minister was to reserve their right of action until the Industry generally had been consulted.

I was further instructed to say that it was submitted that the Council ought to call a General Meeting of the member-undertakings (allowing sufficient time for their representatives to consult their Principals) to ask for guidance as to whether the policy of the Council should be to oppose nationalization by every legitimate means, to acquiesce in the Minister's proposals, or to adopt some other course.

It is understood that the view of the Council is that no useful purpose would be served in calling a meeting of undertaking-members or of obtaining their views by referendum—yet for *all practical* purposes the position has changed little from early February.

The Directors of this Company believe that there is a large body of opinion in the Industry which shares their views, and they ask for room in the columns of your "JOURNAL" to urge those undertakings who share their views to make them known to Gas Industry House now, and at a later stage, if required, authorize their representatives to vote on a resolution.

In conclusion, I am requested to point out that the individual undertakings, as well as the Council, are entitled to know what constitutes the views of the majority. At present they know nothing, and the policy of drift continues.

Yours faithfully,

G. MURRAY BURTON
Secretary, East Cowes Gas Company.

Secretary's Office:
5, Great Winchester Street,
Old Broad Street,
London, E.C. 2.
April 17, 1946.

Economizing Gas

DEAR SIR,—I was very interested in the Paper by Mr. E. W. B. Dunning published in the "JOURNAL" of April 17, and would like to put forward a suggestion regarding the behaviour of boiling rings when the gas is turned down low, and also in regard to the use of saucepans instead of kettles.

Concerning the first point, when the gas is turned down low, the cook has only the visibility of the gas flame to guide her, and, as the visibility over the cooker is both variable and uncertain, I suggest that better control could be obtained if the handle of the gas cock were longer and if a series of clicks could be arranged to enable the cook to be sure that the gas really was turned down to the desired limit.

Turning to the second point I would instance a friend who has for years abandoned the kettle for water boiling, and has substituted a lipped enamelled saucepan marked on the inside with levels for different capacities, so that if a pint of water is needed a pint only is boiled. This saucepan has a transparent lid so that one can see immediately when the water comes to the boil. The use of such a saucepan obviates the inefficiency caused by scale formation on the base of a kettle which occurs in hard water districts.

Yours faithfully,

H. J. TOOGOOD.

"*Stoke-Pero*,"
43, *Uxbridge Road*,
Hampton-on-Thames.
April 23, 1946.

1946 "JOURNAL" Directory

In order to keep the Directory information up-to-date the following alterations should be noted:

Page 26.—EXMOUTH. W. E. Dean, *M.D. & S.*; J. W. Dean, *E. & M.*
,, 28.—GAS LIGHT & COKE COMPANY. *Group Engineers:* Dr. J. Burns (Group 1, Beckton and Southend), S. T. P. Perry (Group 2, Bromley, Bow Common, Stratford, and Shoreditch), S. Hay (Group 3, Fulham, Nine Elms, and Kensal Green), E. G. Stewart (Group 4, Southall, Brentford, Harrow, and Staines). *Station Engineers:* Beckton, H. Bradley; Brentford, S. H. W. Boyns; Bromley, H. W. Moys; Fulham, Dr. A. E. Haffner; Southall and Staines, D. C. Bertram.
,, 88.—KIRKCALDY. D. L. Dickson, *E. & M.*
,, 40.—LEYLAND. Now Leyland-Ormskirk group of Gas Companies. J. Castle, *E. & G.M.*
,, 129.—MONTEVIDEO. W. A. H. Keeley, *G.M. & S.*, J. Rawle, *C.E. & G.M.*, Montevideo, J. N. Whyte, retired.
,, 92.—NEWPORT, Dundee. W. P. Mitchell, *E. & M.*, vice J. L. Thomson.
,, 52.—NORTHWICH. R. B. Smith, *Res. E.*
,, 52.—ORMSKIRK. Now Leyland-Ormskirk group of Gas Companies. J. Castle, *E. & G.M.*
,, 60.—SCARBOROUGH. J. H. Race, *E. & G.M.*, vice A. P. Allan.

Diary

May 2.—Midland Junior Gas Association: Annual General Meeting, Staff Mess Room, Birmingham Gas Department, 6.30 p.m., followed by Address on "The Combustion Characteristics and Sulphur Content of Town Gas," by J. W. Wood, Institution Research Chemist.

May 7.—Southern Association of Gas Engineers and Managers: General Meeting, Grosvenor House, Park Lane, 2.15 p.m. Discussion opened by Dr. E. W. Smith, "Regionalization and the Heyworth Report."

May 8.—North-Western Fuel Luncheon Club: "Fuels and Nationalization," Colonel W. A. Bristowe, Engineers' Club, Albert Square, Manchester, 12.30 for 12.45 p.m.

May 9.—North of England Gas Managers' Association: Annual Meeting, Royal Station Hotel, Newcastle, 2.15 p.m.

May 9–10.—Wales and Monmouthshire Association of Gas Engineers and Managers: Annual Meeting, Prestatyn. Presidential Address, O. P. Cronshaw.

May 10.—London and Counties Coke Association: Technical Committee, Gas Industry House, 2.30 p.m.

May 14.—British Gas Council: Meeting in Lord Mayor's Rooms, Hastings Street, Leicester, 11.30 a.m.

May 15.—Solid Smokeless Fuels Federation: Executive Committee, 11.30 a.m., Dorchester Hotel, Park Lane.

May 16.—Midland Junior Gas Association: Visit to W. C. Holmes & Co., Ltd., Huddersfield, and Inspection of Sulphur Removal Plant of the Mirfield Gas Company; leaving Birmingham Gas Department Offices, 8 a.m.

May 16.—Industrial Gas Centres Committee: Parkway Hotel, Bramhope, Leeds, 10 a.m.

May 17.—London and Southern District Junior Gas Association: Annual Meeting, Gas Industry House, 6 p.m.

May 21–23.—Eastern Association of Gas Engineers and Managers: Annual General Meeting, Dorothy Restaurant, Cambridge.

May 22.—Manchester and District Junior Gas Association: Morning Visit to Warrington Gas-Works; afternoon Visit to Richmond Stove Co., Ltd.

May 25.—Scottish Junior Gas Association (Eastern District): Annual General Meeting, Dunfermline.

May 28.—Women's Gas Council: Annual General Meeting, Gas Industry House, 3 p.m. Speaker, Viscountess Davidson.

May 28.—Southern Association of Gas Engineers and Managers (Eastern District): County Meeting, Southend-on-Sea.

May 28.—Domestic Development Committee, Gas Industry House, 2.30 p.m.

Century-Old Training College

Founded in 1840, the Bishop Otter Training College, Chichester, is one of the oldest establishments in the country for the training of teachers. There are now 200 resident students, and gas has again been decided upon for the necessary replacement of the kitchen equipment at the College.

The illustration shows four Grosvenor Regulo-controlled ovens, two Keswick vegetable and pudding steamers, Chester boiling table and grill, vegetable and milk boilers, hotcloset, and tea and coffee set. With the exception of the last item, all the appliances are finished in Radar porcelain enamel.

The equipment was supplied by Radiation, Ltd., to the order of the Bognor and District Gas and Electricity Company.

Industrial Technicians from Germany

It has been decided to bring over to this country not more than 200 German scientists and technicians to work in a purely advisory capacity for a limited period. The object of this step is to secure for British industry the best industrial intelligence from Germany.

Those chosen, all of them volunteers, will be research workers of exceptional brilliance, or specialists in industrial techniques or processes likely to be of great interest and usefulness to British manufacturers. The acid test in selection is the possibility of a real contribution to development in existing industries or of the establishment of new branches, as a result of the research undertaken.

The experts will be employed by the Government, who will loan them to trade associations and research organizations. All inventions or discoveries will be used for the benefit of industry as a whole. In certain circumstances, opportunities of practical research may best be given by attachment to a particular firm, but there is no question of any German worker holding a position of authority or of replacing any British worker.

During their stay here they will be subject to the normal security safeguards attached to enemy aliens. Before final acceptance, the political background of each will be carefully examined. The Government will grant them salaries sufficient to cover their own board and lodging and the maintenance of their families in Germany. Normal British income tax will be deducted. They will be housed, wherever practicable, in hostels and Nissen huts.

B.T.H. War Record

The war effort was greatly helped by the British Thomson-Houston Co., which company were among the pioneers in the evolution of Radar and jet propulsion, and played a valuable part in the designing, testing, and manufacturing of many types of war equipment.

Radar, the means of locating distant objects by the reflection of wireless waves, is probably the most important discovery of the war. In 1940 the Government approached the B.T.H. and, by means of extensive research in their Rugby laboratories, carried out in co-operation with Government scientists, the first centimetric equipment for A.A. fire control was built. This was followed by an improved model (G.L. 3), which was contained in one trailer, and boasted several other improvements. Since 1942, 715 G.L. 3 outfits have been produced. To locate both attacking and defending aircraft and to guide the latter the Centimetric Height Equipment was developed, and many of these devices were used on the coast. Another apparatus, known as "Glaxo," automatically followed a plane, and furnished its single operator with details of bearing and range. A smaller design ("Cupid") was used for the V 1 attacks. Several thousand airborne Radar units were manufactured for Pathfinder aircraft in the Peterborough factory.

Since 1933 B.T.H. have experimented with gas turbines, and in 1936, with the collaboration of Flight-Lieutenant Whittle (now Air-Commodore), the idea of jet-propelled aircraft was conceived. The many difficulties involved were not completely overcome until 1941, when the first experimental aircraft, designed and made by the Gloster Aircraft Co., and provided with a B.T.H. jet engine, was flown successfully.

Following the design of captured German electrically-propelled torpedoes, the company manufactured, tested, and despatched many of these deadly weapons. Another device for marine use developed by B.T.H. was that designed to defeat the acoustic mine. Eight hundred of these oscillators, which duplicate the sound frequencies of a "singing" propeller, and can explode a mine at a safe distance from the ship, were manufactured. The list of other weapons is too long to quote here, but it may be mentioned that 3,300 generators and 7,500 motors for the R.A.F., 20 million shells, 10 million igniters, and large numbers of predictors, magnetos and other instruments were made in the B.T.H. factories during the war.

The Price of Gas at Limerick has been reduced by 3.12d. per therm Mr. F. K. Thomas, Engineer and Manager, estimates that the gross profit on the undertaking next year will be £11,790, and the net profit, including loss of revenue as the result of the price reduction, will be £4,000.

Mr. R. Alsop, Chairman of the British Coking Industry Association, speaking at the Association conference held in London recently, expressed strong views upon the Government's inclusion of the coking industry in their nationalization scheme. The present situation had been brought about, he asserted, as a result of political pressure from the National Union of Mineworkers and the close proximity of some ovens to the pits. A completely erroneous impression had been created. Coking is a separate industry, and was in no way an integral part of coal mining. It was inconsistent to attempt to justify nationalization of the coal-mining industry on the grounds that that industry was inefficient, and therefore the coking industry must receive the same treatment. With its 17,000 workers the coking industry had long been free from labour difficulties, and, thanks to its enterprising and expanding research association, its methods were among the most efficient in the world.

Institute of Fuel

The Annual General Meeting of the Institute of Fuel was held at the Institution of Mechanical Engineers, London, on April 11. Dr. E. W. Smith (President) was in the Chair.

The President announced that the Council had elected Mr. P. C. Pope, who earlier in the year retired from the Secretaryship of the Institute, as Honorary Member of the Institute. He recalled how Mr. Pope had been instrumental in bringing about the formation of the Institute, with one or two others, in 1927, and how, after a difficult period, he had brought it to its present position of influence and popularity. He also pointed out that there are at present only two other Honorary Members of the Institute—*viz.*, Dr. Travers and Sir Richard Redmayne.

Mr. Pope, after receiving the Scroll of Honorary Membership, gave a brief account of the history of the formation and development of the Institute, and named all those who had done so much work for it, especially in the early years. Many of these, he said, were still active in the interests of the Institute, and as much credit was due to them for the present position of the Institute as to himself.

The President then announced that Dr. C. H. Lander had been elected President of the Institute for the following year.

The following is the result of the ballot for the election of six members of Council: H. Arnold, L. Patrick, Dr. E. G. Ritchie, J. R. Ryland, Dr. P. O. Rosin, and Professor D. T. A. Townend.

Dr. E. W. Smith then delivered his third Presidential Address to the Institute, and devoted it to a discussion of the place of fuel nationally and the possibilities of the future usefulness of the Institute. There was no need, he said, to justify the existence of the Institute. That was evident from the Annual Report. Indeed, he emphasized that there were greater possibilities than ever for the Institute in the immediate future. That seemed to be appreciated in the fact that so many were showing an interest in what the Institute was doing and the manner in which the membership was rising. The membership was something of the order of 1,100 pre-war, and was now just short of 2,600, and that notwithstanding it had been made much more difficult to become a member of the Institute.

Commenting on the great interest now being taken in the technique of the proper utilization of fuel, he said that in his view the problem of primary importance, taking everything into account, was the proper utilization of fuel for domestic purposes. The Institute existed to supply the community with competent fuel technologists, and in every way to stimulate an active interest in fuel problems and the utilization of fuel. In doing this they were continuing the excellent work already started by the Ministry of Fuel and Power, which it was the desire of the Council of the Institute to amplify and back up in every way, not necessarily just following a lead, but giving guidance and assistance.

Continuing, he drew attention to the high standard now required for membership of the Institute, and spoke with satisfaction of the higher standard of those now making application for membership. He claimed that the standard now required is as high as that required for the senior institutions in their own subjects. In this connexion he drew special attention to the Institute's education scheme and to the eventual need for an examination. In the meantime, however, it was desired not to duplicate facilities already available through examinations for other Institutions, and consequently there had been no difficulty in assessing the value of those applying for membership of the Institute where they had qualifications by examination in other bodies which were equivalent to the qualifications required by the Institute of Fuel. He pointed out that joint Education Committees in the Regions with the Ministry of Fuel had been set up, and there was also co-operation with the Ministry of Education, the City and Guilds Institute, and the heads of technical colleges. These joint Committees would work to terms of reference provided by the Institute of Fuel and the Education Committee of the Ministry of Fuel and Power, and there would be no overlapping.

Concerning the finances of the Institute, he referred to the decision a year or two ago to push ahead along certain lines irrespective of the cost, and to the formation of the Special Fund, which guaranteed about £5,000 a year for five years, thanks to contributions from various firms. He said he could not give too much appreciation of the way in which industry, without reserve and without qualification, had backed the work of the Institute in this way. Attention was also called to the fact that a Royal Charter was contemplated.

Continuing, Dr. Smith said that on one or two occasions he had been asked whether the Institute should not arrange a discussion on the question of nationalization of coal mines or the nationalization of the Gas Industry, but the view of the Council had been that political discussions of that nature should not be encouraged. The task of the Institute was to make the system as it existed as efficient as possible. Therefore, there would be no objection to discussing how the new organization could be made more successful, or less unsuccessful. Whatever was the system, it was for the Institute to discuss and try to organize the best method for the employment of that system.

Dr. Smith concluded by again emphasizing his view that there is a tremendous future for the Institute, and that it was anxious to work in the closest collaboration with other kindred bodies. There was no desire to do anything that other organizations were doing better, and it was for this reason the Council of the Institute asked for the maximum collaboration on the part of all concerned in any way with fuel problems. Much was being done along these lines. Already there were the joint Regional Education Committees, and there were also in existence arrangements between the Institution of Gas Engineers and the education authorities for educational facilities in gas engineering. Everything that the Institute could do to assist in cutting out overlapping and promoting collaboration would be done.

Intensive Courses for Gas Engineers

In the "JOURNAL" of Feb. 27, p. 348, we mentioned that the Gas Education Committee of the Institution of Gas Engineers, in collaboration with the Ministry of Labour and National Service and the Ministry of Education, had made arrangements for the initiation of intensive courses for Gas Engineers in Gas Engineering (Manufacture) and (Supply) at Bournemouth, starting on April 29. On April 3, p. 553, we published the details of the courses which had been arranged, giving the costs of these courses and the allowances made for the necessary textbooks. The main provisions apply to courses which have now been arranged to start on June 3 at the Birmingham Central Technical College, which courses are designed to take the candidates to the Higher Grade standard of the Institution by next Christmas. As we have said, a start is to be made on June 3, and the proposed time-table consists of a nine-week term from that date to Aug. 2, a week's holiday, and a nine-week term from Aug. 12 to Oct. 11. After another week's holiday an eight-week term starts on Oct. 21 and is due to finish on Dec. 13. At the end of the course candidates will be required to pass examinations in ancillary subjects set by the Birmingham Central Technical College, and in the main subjects set by the Board of Examiners of the Institution of Gas Engineers.

The following shows the approximate time-table and the subjects to be studied:

Gas Engineering (Manufacture) or (Supply)	5 hours per week.
Mathematics	4 " "
Physics	3 " "
Applied Chemistry	3 " "
Mechanics	3 " "
Power Plant	3 " "
Electro-Technology	3 " "
Building Construction	3 " "
Visits to Works and Special Lectures	3 " "

The cost of the course, excluding textbooks, is £50, and the cost of textbooks is expected to be approximately £10. Applicants who desire to attend this course are advised to make application without delay to the Principal of the Central Technical College, Suffolk Street, Birmingham, 1.

As in the courses to which we have already referred in the "JOURNAL," the Ministry of Labour and National Service will pay grants covering the cost of the course, the cost of necessary textbooks, examination fees, and maintenance fees up to a maximum of £160 p.a. in the case of a single person, with an additional sum not exceeding £110 per annum in respect of a wife and £40 per annum in respect of each child. The award of a grant is restricted to candidates who have undertaken a period of full-time effective service in work of national importance during the war, and who can satisfy the Ministry of Labour and National Service that by reason of this service they have suffered interruption of training for a career in Gas Engineering. As we mentioned in the "JOURNAL" of April 3, application for an award must be made to one of the regional appointments officers of the Ministry of Labour and National Service, of which a full list of addresses was published in that issue.

Lavish production is shown in the copies of the *Sulzer Technical Review* received at this office for perusal. Published by Sulzer Brothers (London), Ltd., these brochures have reached a high quality of production due to their being printed in Switzerland, apparently unhampered by the paper restrictions experienced in this country. Issued quarterly they cover the period 1940–45, and describe in word and pictures the installation of many varied types of apparatus, including pumps for all purposes, heating and ventilating plants, hydraulic power plants, diesel engines, and all kinds of steam and electric power equipment.

In his Presidential Address at the annual general meeting of the Combustion Appliance Makers' Association (Solid Fuel), Mr. S. McEwen said that consumers of solid fuel had been seriously prejudiced not only by a general deterioration in the quality of fuel supplies, but by variation in their character, inseparable perhaps from general shortages and the necessity for accepting deliveries of what happened to be available. In these circumstances inefficient operation of plant was inevitable, and continual adjustment of operating conditions required. If this situation persisted makers of appliances would be driven to design to meet it, and aim at plant which would stand up to any sort of conditions, but which naturally could never be operated at the efficiency attainable with one designed for burning a fuel of standardized character.

Manchester District Association of Gas Engineers

Presidential Address*

of

GEO. E. CURRIER, M.B.E., M.I.Mech.E.,

Engineer and Manager, Bradford Corporation Gas Department

I propose to divide this Address into three parts:

Part 1: A brief account of work carried out at Bradford in recent years.
- Section A: Reconstruction work done up to September, 1938.
- Section B: New works carried out during the war.
- Section C: New works in progress 1946.
- Section D: Future reconstruction programme.

Part 2: Trends in development.

Part 3: Heyworth Report.

PART 1

SECTION A

Manufacture

Prior to 1938 there were three manufacturing stations and five gasholder and distributing stations. The manufacturing stations were:

	Capacity per week (million cu.ft.)
Birkshall Works:	
4 benches (A1, A2, B1, and B2), each of 20 Woodall-Duckham continuous vertical retorts all downwardly-heated (installed 1917)	38
Thornton Road Works:	
8 beds Glover-West continuous vertical retorts (installed 1912)	14
Valley Road Works:	
1 Humphreys & Glasgow carburetted water gas plant	9
Total production capacity	61

In 1934 it was evident that much of the manufacturing plant and machinery, particularly at Thornton Road Works, was approaching the end of its useful life, and that a major reconstruction was necessary. The Birkshall Works covers 21 acres, and has excellent railway sidings (approximately two miles) and communication with the London & North-Eastern Railway. The Thornton Road Works was very congested with an area of only three acres, and had no railway communication. The Valley Road Works covers 15 acres, and has very good communication with the London, Midland & Scottish Railway.

Five schemes of reconstruction (with full details of capital and operating costs) were submitted to the Gas Committee, and the one recommended by me was approved in January, 1936. This scheme provided for the reconstruction and centralization of all manufacturing plant at one works, viz., Birkshall. It comprised the following:

(*a*) CARBONIZING PLANT.

Complete rebuilding of one bench (B1) of Woodall-Duckham retorts with outside producers and upwardly-heated retorts, thereby increasing the number of retorts from 20 to 30 in the bench, and the output of this one bench from 9½ to 19½ million cu.ft. per week. Installation of waste heat boiler.

The Gas Department's specification provided for the carrying out of a guarantee test over a period of three months during any part of the first twelve months' working, the guarantees to be obtained in normal everyday working practice without any special supervision or attention by the staff of the contractor or the Corporation. The test was carried out under these conditions and the contractor's guaranteed results were comfortably obtained. This is the only type of guarantee test to which I would agree. Short period tests are not of much value, and in some cases may tempt the operators to force the plant with the risk of serious damage to it.

(*b*) CARBURETTED WATER GAS PLANT.

Removal of carburetted water gas plant (1.3 million cu.ft. per day, and relief holder (250,000 cu.ft. capacity) from Valley Road Works and their re-erection at Birkshall.

Installation of second carburetted water gas machine of similar capacity.

Both machines equipped with mechanical operators and automatic chargers.

(*c*) CONDENSERS—COAL GAS.

Two Holmes Super-type horizontal tube water-cooled condensers, capacity 4.0 million cu.ft. per day.

(*d*) EXHAUSTER—COAL GAS.

One Holmes Connersville exhauster, capacity 4.8 million cu.ft. per day.

(*e*) PURIFIERS AND HOUSE.

Coal Gas: Four Purifiers 40 ft. by 30 ft. by 6 ft., capacity 3 million cu.ft. per day.

Carburetted water gas: Four Purifiers 30 ft. by 30 ft. by 6 ft., capacity 2.6 million cu.ft. per day. These purifiers were installed by Clapham Bros., Ltd.

With regard to the dry purification plant generally, no catch boxes are used, and the degree of purity is consistently 250 times that required by the Gas Referees' test. The backward rotation system is used. The duplex valves have deep grooves into which are fitted a special grease packing making a "soft" joint against the valve seats.

The valves and connexions are so arranged as to permit the changing over of coal gas through carburetted water gas purifiers and *vice-versa*, and also to allow either stream to pass through another installation of five coal gas purifiers (capacity 4¾ million cu.ft. per day) installed in 1929. With these connexions and valves either of the three sets of purifiers can be isolated, and production of both coal gas and carburetted water gas allowed to proceed uninterruptedly.

(*f*) BENZOLE PLANT.

New Holmes washer and modifications to and reconstruction of remainder of plant.

(*g*) STATION METERS.

One coal gas Holmes-Connersville station meter, capacity 6.0 million cu.ft. per day.

One carburetted water gas Holmes-Connersville station meter, capacity 2.4 million cu.ft. per day.

(*h*) GASHOLDERS.

One spiral-guided gasholder by Clayton, Son & Co., Ltd., capacity 2¼ million cu.ft. This holder is erected on old coal workings; special care was necessary with the foundations, these comprising a reinforced concrete slab built on mass concrete piers.

One carburetted water gas relief holder, capacity 250,000 cu.ft. (seven years old), was dismantled at Valley Road Works, removed to and re-erected at Birkshall Works by Robert Dempster & Son, Ltd., on a new foundation comprising a reinforced concrete slab built on mass concrete piers.

(*i*) GAS COMPRESSOR.

One Holmes-Connersville compressor driven by vertical totally enclosed, double acting, twin cylinder steam engine exhausting at 35 lb. per sq. in. The exhaust steam is used in the continuous vertical retort house. In this way the cost of compression is only 0.07d. per therm (including capital and all other charges). The compressor is used for transmitting gas to Valley Road and Mill Street gasholder and distributing stations.

A second 12-in. diameter high-pressure main was laid between Birkshall Works and Valley Road Works (3,815 yards), with an 8-in. branch main to Mill Street Works (length 186 yards).

(*j*) ELECTRIC GENERATOR—150 KW.

Metro-Vickers alternator driven by a Bellis and Morcom compound vertical steam engine. This set is used as a standby for the town supply of electricity.

(*k*) CANTEEN.

A new canteen having accommodation for 150 employees and provided with washing accommodation and shower baths. Hot meals and snacks are provided, and the canteen is managed by a committee of five representatives elected by the men themselves.

(*l*) COAL TESTING PLANT.

Arrangements were made for the isolation of two retorts in each of two of the main retort benches (B1 and B2) for the testing of coals on a practical working scale (10 tons per day) and under normal working conditions. The gas stream from either pair of retorts can be isolated and is taken through a complete set of auxiliary plant and apparatus comprising the coal-testing plant, and the results from this plant are of the greatest value.

The reconstruction scheme also included work at other stations, viz.:

* Presented April 26, 1946.

VALLEY ROAD WORKS.

Gasholders, two: The replacement of two three-lift column-guided holders (each 750,000 cu.ft. capacity) with two four-lift spiral-guided holders (each 1,000,000 cu.ft. capacity) in the same underground tanks, which are of brick construction with clay puddle backing and concrete dumplings. When the tanks were emptied, the water pressure from underground springs was sufficient to break the concrete dumplings, and continuous pumping, night and day, was necessary to keep the tanks reasonably free of water during the construction of the new holders.

MILL STREET WORKS.

Gasholder: The two-lift column-guided holder (capacity 580,000 cu.ft.) was replaced by a two-lift spiral-guided holder (capacity 616,000 cu.ft.) in the same tank. Provision has been made for building a third lift at some future date.

Appliance and Meter Repair Shops and Stores: New appliance and meter repair shops and stores were built.

Capital Costs

Although vastly different from the prices prevailing to-day, it is thought that the capital costs of this reconstruction scheme may be of interest, and these are set out below in Table I. These costs are total, including all contract and direct labour work:

TABLE I.—COSTS OF RECONSTRUCTION, 1936–1938.

Plant.	Capacity.	Total costs. £
Birkshall Works.		
Woodall-Duckham Carbonizing Plant and Waste Heat Boiler	19.5 mill. cu.ft. gas per week	34,439
House for Waste Heat Boiler	—	330
C.W.G. Plant:		
One new plant complete and removal and re-erection of similar plant	1.3 mill. cu.ft./day 1.3 " "	31,365
C.W.G. Relief Gasholder—removal and re-erection on new foundation	250,000 cu.ft.	5,767
2 Coal Gas Condensers	each 2 mill. cu.ft./day	4,583
1 " Exhauster	4.8 " "	941
Purifiers and House:		
Coal gas	3.0 mill. cu.ft./day	22,132
Carburetted water gas	2.6 " "	
Benzole Washer, &c.	—	3,986
Station meters:		
Coal gas	6.0 mill. cu.ft./day	1,370
Carburetted water gas	2.4 "	903
Gasholder and Steel Tank and Foundations ...	2½ mill. cu.ft.	40,328
Gas Compressor	6.0 mill. cu.ft./day	1,208
12-in. diam. H.P. Main (incl. welding) ...	3,815 yd.	7,320
Gas Mains and Connexions on Works ...	—	2,169
Steam Mains	—	730
Water Mains	—	941
Water Coolers	—	332
New Roadways	—	427
New Boiler House	—	899
Canteen	—	2,638
Valley Road Works.		
2 Gasholders in existing Tanks	each 1 mill. cu.ft.	30,326
Mill Street Works.		
Demolition	—	60
Appliance Repair Shops and Stores	—	5,972
8-in. diam. H.P. Main	186 yds.	337
Governor Connexions	—	236
1 Gasholder in existing tank	616,000 cu.ft.	9,969
Miscellaneous Items	—	6,198
	Total	£215,906

By the completion of this reconstruction scheme, the total productive capacity was increased from 61 to 66 millions cu.ft. per week, and in 1938 the maximum weekly output was 51 million cu.ft.

SECTION B

The following new works have been carried out during the war period 1939–1945, and all at Birkshall Works:

1. 1940. ARTESIAN WELL.

2. 1941. COKE HANDLING PLANT by Robert Dempster & Son, Ltd.—Prior to 1941 there was one long G.B. conveyor encircling the retort house to handle all the coal and coke for A1 and A2 benches of retorts and another for B1 and B2 benches of retorts. To reduce the wear and tear on the G.B. conveyors (each 715 ft. long) and to provide an alternative handling plant for coke, electrically-driven coke trams (35 cwt. coke capacity) were installed together with a balanced skip hoist, one skip for each pair of retort benches plus a belt conveyor to convey the coke to the screening plants. The G.B. conveyors are now used for coal handling and the trams and skip hoist for coke removal.

3. 1941. LANCASHIRE BOILER, 30 ft. by 8 ft.

4. 1942. GRID GAS SUPPLY.—In order to meet rapidly increasing consumption of gas, arrangements were made to take a supply of gas from the Grid of the West Yorkshire Gas Distribution Company up to a maximum of 15 million cu.ft. per week, and so increasing the total productive capacity to 81 million cu.ft. per week. This involved the laying of 4¼ miles of 8-in. diameter main, together with the erection of a new house in which were installed the necessary governors and meter. The work was commenced in April, 1942, and the supply of gas commenced on Aug. 17, 1942.

5. 1943. COAL HANDLING PLANT by Robert Dempster & Son, Ltd.—Additional to the two existing wagon tippers, a rotary wagon tippler and receiving hopper were installed, together with a duplicate bucket elevator. This necessitated a new railway siding laid on concrete sleepers.

6. 1943. AMMONIA WASHER, by W. C. Holmes & Co., Ltd.—A static ammonia washer (5 million cu.ft. per day) was installed to replace a worn-out rotary scrubber.

7. 1943. A1 BENCH OF WOODALL-DUCKHAM CONTINUOUS VERTICAL RETORTS.

8. 1944. A2 BENCH OF WOODALL-DUCKHAM CONTINUOUS VERTICAL RETORTS.—These two benches of retorts (20 in each) were completely rebuilt with the latest design top and bottom ironwork and new liquor circulating systems.

9. 1944. RETORT HOUSE STOKERS' MESSROOM.

10. 1945. EXHAUSTER—COAL GAS.—A new Holmes Connersville Exhauster (capacity 6 million cu.ft. per day) driven by steam engine was installed.

11. 1945. GAS COMPRESSOR.—A new Holmes Connersville compressor (capacity 4 million cu.ft. per day) electrically driven by 120 h.p. motor was installed.

Table II gives the costs of the above works, including contractors' and direct labour work:

TABLE II.—PLANT: BIRKSHALL WORKS.

	Total costs. £
Artesian Well	3,847
Coke Handling Plant	6,657
Lancashire Boiler (and dust-collecting chamber)	3,813
Grid Main, Governor and Meter House ...	17,106
Coal Handling Plant	9,573
Ammonia Washer	3,813
A1. Bench Woodall-Duckham Continuous Vertical Retorts	28,476
A2. Ditto	34,821
Retort House Stokers' Messroom	1,939
Exhauster—Coal gas	1,058
Gas Compressor	1,293
Total	£112,396

Apart from new works, mention may be made here of other phases of the Department's activities during the war:

APPLIANCES AND SHOWROOMS.

The showrooms and demonstration room have been centres of activity throughout the war, and both have been frequently loaned to the Women's Voluntary Services, and to assist in the several War Savings Weeks.

Domestic appliances have been in short supply, the only one available in quantities being the gas poker, of which large numbers have been sold. Of course, there have been large sales of canteen apparatus and equipment to industry.

INDUSTRIAL GAS SECTION.

This Section has been extremely busy in supplying gas and equipment for the production of munitions. One works along increased its load to 130 million cu.ft. of gas per annum, and the total industrial and commercial load approximates 1,200 million cu.ft. of gas per annum.

Furnaces with permeable linings have been installed, and in one case the gas consumption for annealing steel castings has been reduced from 10,000 cu.ft. to 6,000 cu.ft. of gas per ton of metal, this in a furnace having a throughput of 2,000 tons of castings per annum.

GAS TARIFF.

A two-part tariff was offered to all classes of consumers in 1933. This tariff has continued throughout the war period, and nearly 20% of our consumers now use it. The tariff was amended in 1940 by the inclusion of a coal clause for all non-domestic consumers.

Bradford was one of the first provincial towns to be bombed by the enemy (Aug. 31, 1940), but in the light of later events elsewhere it was not a heavy attack. The benzole plant at the manufacturing station received a direct hit and was put out of action for over 12 months, but otherwise gas production was unaffected. The distribution system suffered, several of the larger trunk mains being badly damaged. As a result of waterlogging of some of the damaged mains, a small portion of the central area of the City was without gas for one or two days. Apart from this incident, the undertaking continued to supply gas of the standard quality and pressure throughout the whole of the war period. Contrary to our ideas at the time, the bombing of Bradford was not haphazard, but was programmed by the Germans, as is shown by a German map of Bradford. Translation of the notes on it indicate that the two targets were the gas and electricity works, and details of the plant and buildings at each are shown in the margin.

When this reconstruction and centralization scheme was decided upon in 1935–36 it was undoubtedly sound policy, as there were then no war clouds on the horizon. With the outbreak of war, however, we were not without certain qualms in having all our manufacturing plant at one works. Fortunately, as previously stated, although the works was bombed, production was not interrupted. There is no doubt that without this reconstruction the Gas Department could not have given Bradford a full supply of gas during the war period.

Section C

Work in progress during this year includes:

Birkshall Works.

1. Complete rebuilding of B2 bench of 20 retorts with new top and bottom ironwork and new liquor-circulating system.
2. A Holmes Connersville coal gas meter—capacity 6 million cu.ft. per day.
3. Two carburetted water gas exhausters—Holmes Connersville—capacity of each 3.6 million cu.ft. per day.
4. Installation of third carburetted water gas machine, capacity 1.5 million cu.ft. per day. This will increase the total productive capacity to 91.5 million cu.ft. per week.
5. Two electrostatic de-tarrers for coal gas—each 5 million cu.ft. per day.

Valley Road Works.

5. New governor house and installation of three new station governors.

Section D

Future Reconstruction Programme

Estimates have been prepared for further reconstruction at the manufacturing station, gasholder and distribution stations, and of the distribution system, appliance and transport depot, showrooms and offices during the next five years as follows:

TABLE III.

	£
Manufacturing Station	153,230
Distribution System ... ... } Gasholder and Distributing Stations } ...	93,671
Appliance and Transport Depot	34,412
Head Offices and Showrooms	3,971
Total	£285,284

The main items in this reconstruction programme are:

(*a*) Manufacturing Station.

Complete new installation of coke-handling and screening plant with automatic bagging and weighing machinery. Also plant for the removal of organic sulphur. The other items at this station are of a miscellaneous nature.

(*b*) Distribution System.

This scheme provides for approximately 15 miles of high pressure feeder main to supply outer suburbs, also for the automatic operation and control of gasholder and distributing stations from a central control room.

(*c*) Appliances and Transport Depot.

At Mill Street Works provision is being made for improved and additional accommodation for appliance stores and offices, industrial gas section, street lighting section and transport depot.

Potential Productive Capacity

At the end of this year (1946) the productive capacity will be:

Coal gas . . .	48.0	million	cu.ft.	per week.
Carburetted water gas .	28.5	,,	,,	,,
Grid supply . . .	15.0	,,	,,	,,
Total . .	91.5	,,	,,	,,

The manufacturing station at Birkshall has sufficient area for the installation of additional coal gas plant of 6 million cu.ft. per day. Also at our Valley Road Works a coal gas unit of 7 million cu.ft. per day can be accommodated.

With these two additional coal gas units the total productive capacity could be increased by 84 million cu.ft. per week to a total of 175.5 million cu.ft. per week.

This has given you a brief résumé of the work done in the last 12 years, together with a peep into our future programme. The technical, commercial, and administrative work has been carried out by a team of competent and willing assistants, who have not been afraid of hard work.

Financial Results and Statistics

Summarizing the financial results of the period 1932–1945, while the expenditure of a capital nature amounted to £360,994, the outstanding debt on the undertaking has been reduced by £119,501 to £434,727, and the reserve funds have been increased by £61,588 to £194,724. The reserve funds would have been £40,000 more but for a contribution to relief of rates of £10,000 in 1932 and £15,000 in 1935 and 1936 respectively. The outstanding debt at Mar. 31, 1945, was £434,727, equal to £180 per million cu.ft. gas sold. The economies effected by the reconstruction and centralization scheme, 1935–1938, are largely masked by the general all-round rise in prices which commenced about that time.

Production

There are two items concerned with production which may be of interest to members, namely:

1. Life of Retorts.

The life of retorts in the four benches has been:

		Working Days.
A1.	Bench Downwardly-heated	3,388
A2.	,, ,, ...	3,722
B1.	,, Upwardly-heated (Est. to 31.iii.47 when rebuild is due)	2,833
B2.	,, Downwardly-heated	3,121

The working days do not include days in the heating up or cooling off of retorts, nor do they include days when the retorts are off for scurfing. Particular attention is given to the scurfing operation, and no air is admitted at the bottom of the retort. After scurfing, each retort is carefully examined for leakage. Small leaks are cement sprayed and larger leaks are welded. Combustion chamber temperatures are 1350–1380°C. The cost of cold retort repairs (including ironwork) for the 14 years to 1943 averaged 13.7d. per ton of coal carbonized.

2. Fuel Efficiency Index of the Undertaking.

(The Declared Calorific Value is 475 B.Th.U. per cu.ft.).

Year ended Dec. 31.	Fuel Efficiency Index. %	Thermal Efficiency. %
1942	19.0	81.0
1943	19.7	80.3
1944	19.8	80.2
1945	18.8	81.2

PART 2

Trends in Development

I would like to take a few moments to indicate possible trends in future development.

Manufacture.

Until complete gasification by either the high-pressure or the methane synthesis process becomes commercially successful, the Industry must continue to produce two main fuels—gas and coke. It must be remembered that the Industry has, for a number of years, had the opportunity to practise complete gasification by the combined operation of carbonizing and carburetted water gas plants, but it has not been a paying proposition to do so. Therefore, the well-established production processes will continue, but in larger units than heretofore. In the design of new plants it will be necessary to provide better working conditions. Ventilating and dust-extracting plants must in time become more or less universal.

Coke Handling.

Efficient grading and debreezing must be the rule in all plants, together with automatic bagging and weighing machinery.

Dry Purification.

The use of tower purifiers is likely to increase, and it is hoped that the wet oxide purification process will be successfully developed, and so eliminate the arduous process of removing spent oxide from purifiers as part of normal gas-works routine.

Sulphur Removal.

The installation of plants to limit sulphur content to 10 grains must proceed rapidly.

Distribution.

High-pressure ring mains will give the desired margin and flexibility which are necessary with the migration of the population away from town centres.

The use of trunk mains at intermediate high pressures (about 30 in. w.g.) can only have limited application.

The automatic operation and control of gasholders and boosters, particularly of out-stations, on the lines of the Liverpool Gas Company has much to commend it.

Appliances and Meters.

A greater degree of standardization than that so far achieved is necessary. The profits on appliances should be merely sufficient to cover overhead charges. All maintenance should be free, with only a charge for any materials used.

Statistics and Costing.

Standardized costing and statistics are an urgent necessity.

GAS TARIFFS.

There must be a much greater degree of uniformity of the basis for gas tariffs. It may be that a two-part tariff and a block tariff, available for industrial, commercial and domestic consumers, will provide the best solution to this problem, and so secure the advantages of each of these two types of tariff.

PART 3

THE INDUSTRY—HEYWORTH REPORT

A Presidential Address given at this time would not be complete without some reference to the future ownership of the Gas Industry.

The Report of the Heyworth Committee has been published, and it must be remembered that this Committee was appointed by the Minister of Fuel and Power (Liberal in politics) of a National Government; that the Committee sat for nearly 18 months and received evidence from individuals and representatives of undertakings, also from representatives of all our national Gas Associations and others allied to our Industry; further, that the Chairman of the Committee (Mr. Geoffrey Heyworth) is the head of one of the largest private enterprise businesses in this country.

On Dec. 6, 1945, in the House of Commons, the Prime Minister (Mr. Clement Attlee) stated in the debate on the Motion of Censure "that the Heyworth Report was not based on theories or ideologies, but on the plain facts as they presented themselves to common-sense men." On the same day the Lord President of the Council (Mr. Herbert Morrison) stated: "We are going to socialize gas, in which connexion the Government was favoured with a report by gentlemen who cannot be accused of being Socialist nominees."

Briefly the result is that the Committee recommend public ownership of the Gas Industry, with control by experts through ten Regional Boards. My mind goes back to the summer of 1941, when I was privileged to be one of a small party of engineers and others who spent a week-end together to discuss one subject only, "The Gas Industry." During this week-end I advocated the policy of public ownership of the Gas Industry. In October, 1944, I was privileged to read a paper before this Association dealing with "Four Major Problems of the Gas Industry." The fourth and most important was "Ownership and Integration," and I then put forward a scheme of public ownership providing for the setting up of a Central Gas Board of experts, together with Regional Boards.

I welcome the Heyworth Report, and I should not be human if I did not feel some sense of satisfaction in finding the recommendations in this Report so similar to the scheme of ownership and control which I have advocated for the past five years.

While I am in substantial agreement with the recommendations, there are some which may be criticized constructively.

Regional Boards

The recommendations of the Committee provide for ten Regional Boards, each having a Chairman and three Directors with functional responsibilities, together with three part-time Directors. The practice of Directors having functional responsibilities is becoming more and more common in industry generally, and it is pleasing to note this recommendation. I suggest there should be six whole-time Directors, one each responsible for:

1. Production.
2. Distribution.
3. Sales and Service and Public Relations.
4. Accountancy, Statistics, and Costing.
5. Residuals.
6. Labour and Welfare.

I would strongly press for some co-ordinating committee between the Regional Boards and the Ministry of Fuel and Power. On such co-ordinating committee, call it Central Gas Board or what you will, there should be a representative for each Region, and such Central Committee would then provide liaison between the Regions and the Ministry, and prevent overlapping of the work carried out in the various Regions. The Committee would also assist in framing a common policy for the Industry throughout the country to the extent considered desirable and practicable. It would also be valuable for the pooling of experience and knowledge of all Regions.

Coke Oven Plants

I would press very strongly for the inclusion in the reconstructed Industry of all those coke oven plants which supply gas for town purposes. This is absolutely essential in order to secure the full benefit of bulk supplies into the Regions from coke oven plants, and also in order to reduce standby plant and holder capacity to a minimum.

Gas Quality, Gas Testing and Testing of Meters

GAS QUALITY.

The limitation of declared calorific value to a range of 450–500 B.Th.U. per cu.ft. is one which I am pleased to see, and I think there should be no difficulty in working to plus or minus 3% of the declared calorific value for any period of two hours or upwards, provided undertakings are allowed to receive the most suitable coals for carbonization. To ensure this there must be full co-operation between the Coal Division and the Gas and Electricity Division of the Ministry of Fuel and Power.

SPECIFIC GRAVITY.

The recommendation of plus or minus 5% variation in declared specific gravity is one which will present difficulty, particularly where carburetted water gas plants are in operation, and I submit that this limit should be increased to a plus or minus variation of at least 7½%.

INSTALLATION OF GOVERNORS AT INDIVIDUAL METERS OR AT INDIVIDUAL APPLIANCES.

I am not sure that the universal adoption of this recommendation is absolutely necessary, and I would prefer to see this left to the Regional Boards for their discretion.

SULPHUR CONTENT.

The recommendation to limit the sulphur content to a maximum of 10 grains per 100 cu.ft. of gas is satisfactory, and I hope that this limit will be still further reduced in the not too distant future to 3 to 4 grains per 100 cu.ft.

METERS.

I had anticipated that there would have been a recommendation for meters to be brought in at intervals for testing, probably every ten years. Such a recommendation has not been made, and this can perhaps wait until the reorganization of the Industry has taken place.

The Aim of the Industry

The aim of the Industry must always be to give as near 100% service as possible to each and every consumer. Efficient and prompt service is invaluable in the establishment and maintenance of the goodwill of consumers, and is the best form of propaganda. This service is more important than a small reduction in the price of gas per therm. To achieve this the following are necessary in every area of supply:

1. Adequate manufacturing plant supplying gas at a constant calorific value (±3%), constant specific gravity (±7½%), with a sulphur content not exceeding 10 grains per 100 cu.ft.
2. Adequate distribution system, which will permit each and every consumer to have a gas supply throughout each day of the year with a total pressure variation not exceeding 0.5 in. W.G.
3. A real live active sales development organization for domestic, commercial and industrial consumers with promotional tariffs and gas at the lowest economic price.
4. Twenty-four hour emergency service to deal with all reported escapes of gas, and a 24-hour service to deal with all consumer complaints promptly.

Conclusion

The most vital period will be from now on until the appointed day for the transfer of undertakings to the new ownership. It is absolutely essential that in this period the Gas Industry shall go on, not just ticking over, but full speed ahead in giving the greatest possible service to the community. We have a paramount duty to our consumers, and there can be no excuse for easing off in any direction.

In this interim period there will no doubt be cases of expenditure being incurred which will not be remunerative when reorganization and integration has taken place, but this is inevitable in order to enable all undertakings to be kept functioning. At the same time it is essential for undertakings in an area to get together and to examine problems, particularly of production, in the light of future linkings-up. In this way the incurring of further capital expenditure on production plant of an undertaking which is likely to cease as a production unit in the next few years may possibly be avoided by the taking of a bulk supply from a neighbouring undertaking.

From the date of transfer it will conceivably take a period of five to ten years for the new ownership to become fully effective. In my opinion the complete co-ordination of all undertakings regionally and nationally can only be achieved by one common ownership. A system of public ownership does not mean that all the small undertakings will have to close down—many by reason of their geographical position will even have to continue as production units. What it does mean is that there will be one completely unified and co-ordinated Gas Industry, with all its resources pooled, including finance. This will inevitably result in greater development in every phase of our business. The services of specialists in every branch will be at the disposal of all undertakings—these services, which are now available for a few, will be greatly extended, and there for all to share.

There is then a clear call to all engaged in the Gas Industry to pull their weight and make their full contribution in the new organization, and I have no doubt of the response of the personnel concerned.

Provided, therefore, that the control is given to experts carefully chosen for their competence, courage and vision, then the Industry will go from strength to strength, and render to the community a greater and better service than ever before.

A New Method of Increasing Retort Tightness

The following discussion took place on the Paper on "A New Method of Increasing Retort Tightness," which **Mr. A. Bird,** London Manager of West's Gas Improvement Company, Ltd., presented at the meeting of the Southern Association of Gas Engineers and Managers (Eastern District) at Gas Industry House on Mar. 26. The Paper was published in the "JOURNAL" of April 24.

The Chairman (Mr. G. L. Braidwood) said the question of trying to keep retorts tight was a not a new one. Some years ago, concurrently, he believed, with Mr. Clucas's work at Leeds, an extensive survey was carried out at Beckton in which they measured the rate of air loss from horizontal retorts, and they recognized the importance of scurf as a sealing agent. It was found that retorts leaked 50 times as much after scurfing as before, and generally recovered their normal tightness about 30 hours after recharging following the scurfing period. Retorts leaked fairly heavily when they were new, appreciably less in middle age, due to the penetration of carbon into the interstices of the brickwork, and again became more leaky in old age, due to small holes and cracks that had arisen in the meantime. In general it was probably true to say that losses from ordinary segmental silica retorts were anything up to 5% in therms per ton, though momentary loss could be much higher. In addition it was found that the average tight segmental silica retort lost about 0.7 therm for every tenth of an inch differential pressure between the inside and outside of the retort. In the case of verticals, if they lost only two therms per ton they considered they were doing well. At Southend they tested one row of segmental silica retorts, and a gas analysis was taken immediately after scurfing, and it was found that the inerts in the case of an untreated retort after scurfing amounted to 15%, whereas after treatment with air-borne sealing it was only 6%, but the untreated retort recovered its normal tightness after 36 hours.

Works "A" in the Paper was the Southend works. Two beds, reconstructed last year, were given an air-borne sealing treatment before being put to work, and subsequently at every alternate scurfing. The normal scurfing period was one month, so that the beds, after their initial treatment, were treated every two months. The loss by leakage from the treated retorts was only one therm, as against 2½ therms for the remainder of the house with untreated retorts. On that basis they appeared to be saving 1½ therms per ton. Mr. Bird had modestly made no particular claim as to increased therms resulting from treatment, but it was quite clear that the retorts were tighter. On the basis of 1½ therms per ton being saved, it was a matter of interest that for a cost in a retort house of something under £250 per annum they gained about 90,000 therms in the course of a year, assuming approximately 60,000 tons of coal carbonized. Mr. Bird had not made reference to possible anticipation of longer life of retorts; possibly it would take several years to establish such a proposition. With the lower inerts resulting from treated retorts there was a further indirect saving, which had not been taken into account in the figures given. They had tested several individual retorts which had proved to be leaky, having only small holes, and after air-borne sealing treatment the results had been very gratifying.

Prolongation of Life

Mr. **Frank West** (Derbyshire Silica Firebrick Co.), in a written contribution read by the Secretary, said the Author was to be congratulated on developing a method for increasing the gas tightness of retorts which was both simple in principle and simple in application. Apart from the benefits gained by a reduction in the inert content of the gas from retorts during the initial period after scurfing, there were bound to accrue considerable benefits in relation to the prolongation of the life of the retort structure. There was a limit to the width of crack which could be successfully sealed by this method, and it would appear obvious that the method would prove of greatest value to those installations where the treatment had been regularly applied from the time when the retorts were first put to work. The experience quoted from works "G" was, however, a valuable indication of the efficacy of the method when applied to retorts in which leakage was considerable and of relatively long standing. From the standpoint of effect on refractories the selection of the most suitable types of materials for the sealing powders presented problems of chemical composition, grain size and intimacy of mixing which required to be carefully studied in relation to their probable reaction with the refractory materials of construction under subsequent carbonizing conditions. Caution should be exercised in the usage of powders other than those within the range of composition specified in the Paper. The necessity for obtaining deposition of the powder as deeply as possible within the crack was a point which could not be too strongly emphasized, for by this means the sealing would be rendered more permanent. The Author had provided a tool for use in the Gas Industry which promised to be of great value, and thereby opened up a considerable field for investigation in relation to the extension of this technique to other industries.

Mr. **J. N. Shorrock** (Central Laboratory, Birmingham Gas Department), in a written contribution read by the Secretary, said West's method of airborne sealing had been introduced recently into Birmingham, and first impressions led them to expect their newer ranges to maintain a high degree of tightness for longer periods than before. To obtain some information on the way the process functioned they carried out the procedure on a cold retort, while realizing that this was not comparable with working practice in several ways, *e.g.*, as regards the effects due to convection eddies and the increased viscosity of air at high temperatures. The retort used required patching, and they were only able to raise the pressure from $\frac{35}{1000}$ in. to $\frac{75}{1000}$ in., using 4 lb. of the normal powder. More powder might have given a higher final pressure. After the operation the retort was entered, and every fine crack from top to bottom of the retort was found to be outlined in powder. Cracks narrower than about $\frac{1}{16}$ in. were closed by a felted mass of fine particles about $\frac{1}{8}$ in. deep. Wider cracks were not, in general, closed, though some approximately $\frac{1}{16}$–$\frac{1}{8}$ in. were apparently in the process of being bridged. Examples of penetration into still larger cracks and fissures to a depth of over 1 in. were found Ledges and roughnesses had a liberal covering of powder. No material was obvious in the combustion chambers.

The material collected from the bottom of the retort contained a higher proportion of coarse material than the original, and had a higher softening point. Hence much of the finer material and the majority of the flux remained in the cracks, or on any ledges, &c., or was carried forward in the air stream. Similar results were found upon collecting the material falling to the bottom of a hot retort during its routine airborne sealing. With a view to examining the mechanism of blocking with different airborne powders, an 8 ft. high plywood model of a vertical retort was constructed, arranged to allow a portion of the "end wall" about 3 ft. 6 in. from the floor to be replaced by several whole or cracked bricks. Powder and air were admitted at the top of the model under controlled conditions. A glass panel in the "side wall" allowed any building up between the "end wall" bricks and the glass to be viewed while in progress. A gauge enabled the pressure variations to be followed. On dismantling the bricks filling the cut-away portion of the wall, an idea of the efficiency and manner of blocking could be obtained. Experiments were still in progress, but among the points so far noted were: (1) That the majority of the building up was at the entrance to the cracks; (2) other building up inside the cracks was normally as a type of stalagmitic growth so to speak, built up against the air stream, and reminding one forcibly of the formations built up sometimes by unfused flue dust in a waste gas flue; (3) in the case of a normal fine crack up to $\frac{1}{16}$ in. wide the material inside the crack was rarely larger than 25 mμ., or $\frac{1}{1000}$ in. dia., and much of it is below 5 mμ.

Factors Influencing Results

The optimum conditions for getting good results with airborne sealing were difficult to forecast theoretically. Among the factors influencing the result were the size, shape, weight and nature of the particles, their velocity when entering the cracks, roughness or otherwise of the crack and its ramifications, &c. One could hardly expect the material to lodge in a straight-through crack or open joint with smooth sides. Assuming Stokes' law to hold, as the particles concerned appear to be mainly of a size below 85 mμ. (which was the limiting low value for crushed quartz), the average speed of fall at 1,000°C. would be several times slower than at normal temperatures—*e.g.*, in air a particle 50mμ. in size which would fall some 13 cm. per second, at normal temperatures, would fall about 5 cm. per second at 1,000°C. as a result of the compounded effect of decreased density and increased viscosity of air. The rate of fall would vary according to the square of the effective diameter of the particles, but the overriding considerations were the velocities imposed on the particles by convection currents, and by air under pressure escaping through any available openings.

Obviously if possible the most desirable result would be obtained when a crack was filled, not by a rapid sealing over by several large particles, which might be easily dislodged, but by an ordered, compact filling, extending from some distance inside the crack to the retort face. Additional strength would be given if the material would frit together at normal retort temperatures, but the likelihood of serious erosion due to the possible too-ready fluxing if the temperature rose appreciably must be guarded against. Mr. Bird had alluded to the advisability of avoiding segregation, and their experiments pointed to the need of making either a definite frit, or alternatively choosing a natural mineral having the desired characteristics and homogeneity. In either case it appeared desirable to grind as finely as possible.

The possibility of using first a carefully controlled flux to make the refractory adhesive, and following immediately with a refractory powder, had occurred to them as a possible way of building up a permanent repair. Routine blowing of retorts with the powders supplied appeared to have a satisfactory effect if they could judge from the final pressures obtainable, which had a general tendency to increase with successive treatments of a particular retort. There were certain types of settings which would appear to be unsuitable for this treatment unless in first-class condition, as it seemed possible that outgoing

air might reach unfilled cavities and ultimately find its way through other cracks into a neighbouring retort. Should this be gas-making there was a danger of severe damage.

The Germ of Correct Procedure

Mr. A. T. **Green,** British Refractories Research Association, said he had been concerned with the durability of refractory materials for the past 20 years, and when he heard of the process described by Mr. Bird he naturally asked himself, "Why didn't I think of it first?" He had always had an objection to water of any kind going on to a hot refractory surface. He was not suggesting that it was not necessary on occasion to use water in some form, but the principle fundamentally was not a correct one. If, therefore, there was any method of getting dry powder as a patching agent on to a retort, it seemed to him to have all the advantages incumbent upon a structure at high temperature. When this process was indicated to him and he had the opportunity of seeing it in action, he felt definitely that it had in it the germ of correct procedure in retort maintenance. If they could stop disadvantageous reactions taking place in the body of the retort during the early stages, there would be a very beneficial influence on the durability of the retort in the later stages. In gas-making they were bound to get scurf in a specific zone; it was definitely associated with flaking. Any process which tended in any way to make up the retort surface after each scurfing and to keep it as nearly tight as possible would cut down the liability to flaking. They had to take care of the retorts in the early stages, as it had been proved repeatedly that there was leakage in the very early stages of the life of a retort, and he looked upon this process with a considerable amount of pleasure. By tending to keep cracks and initial interstices filled, they were going to get not only a saving in gas, but a great step towards durability. He thought the process was only in its infancy, and it would no doubt be developed over a period, first by laboratory work, and secondly by practical experience. As regards the constitution of the powder, he thought it might be desirable to get a powder which would be artificially prepared. A fair amount of work required to be done on the powder; the type of powder to be used in the early stages would be different from that used for the later stages. A very important point was the actual size of the powder that was most effective. He felt that with further development the process would cut down gas leakage and increase the durability of retort working.

Wedge Shape Cracks

Mr. L. **Muir Wilson** (South Metropolitan Gas Company) said when sealing of small cracks was necessary there was much to be said in favour of powder, but he did not think he would like to see large quantities of material containing so much alkali blown through large holes into the combustion chambers. With the old siliceous retorts they had a lot of trouble, for at 1,360°C. they were always in a semi-molten condition on the chamber side, so that surface tension effects caused axial cracks to appear which penetrated in time to the coal side. These cracks were wedge-shape in section, and consequently it was difficult to get any patch which was applied from the coal side to stay put. More often it slithered down and stopped up the gas and air ports instead. Leakage was aggravated by maintaining vacuum in the collecting system. All that really happened was that there were pressures, probably higher than 20 in. W.G., between the plastic layer and the retort wall when the charge was first laid, so that much of the richest gas went out through the holes. As the plastic layer receded the pressure gradually fell to vacuum, and then waste gases, often airy, were drawn in through the holes. A tenth or two change in vacuum could have little effect on this kind of thing. When vacuum appeared the holes had already been partially sealed by carbon deposits, but this carbon was rapidly removed by the incoming waste gases and the holes often made larger by the combustion of carbon, coke and gas in their vicinity, so that there were bigger and better holes awaiting the arrival of the next new charge. Thus the vicious circle gyrated.

They decided that the only cure for this was to build retorts of silica or Derby silica which had a high and definite melting-point, and to work under pressure throughout the cycle. To maintain pressure at all times they introduced scrubber standpipes in which the pressure never fell below $\frac{5}{100}$ W.G. They now found that the gas carbon deposited in the cracks formed a perfect seal. They were able to scurf continuously without any signs of leakage and no patching was needed. The inerts were now only those derived naturally from the coal. Three years ago when they were first charging a section of this type they maintained 2 in. W.G. in the mouthpieces, and after 20 minutes there was no sign of leakage at all. Ever since their therm yield at this works had been as good as their best. To test a retort for tightness with air was futile, for air was not a carbon gas and would go where methane and the like would not. On high ovens and vertical retorts the conditions were quite different, due to the natural buoyancy of the gases and to the effect of steaming when this was done, so it seemed that there was a good use for a ready means of hot patching, but this should never be necessary on modern installations of horizontal retorts, except that the problem of tight collar joints still left a little to be desired, though he thought they were making headway there.

People who claimed that their retorts were tight often told him that they kept their calorific value down by pulling. To say the least this was contradictory. At one of their stations where all the retorts were worked under pressure they got their best results. Instead of making a small amount of producer gas in the retorts by pulling in waste gas, they saved an appreciable quantity of high calorific value gas by preventing leakage after charging, and this was reflected in their therm and benzole yield.

A Unique Case

Dr. A. E. **Haffner** referred to what he described as a unique case where powder sealing had proved to be the only remedy. Two years ago they had a new bench of balanced heating settings put into action. Two months later a survey of the leakage revealed 115 leaks in what were perfectly good retorts; 20 of the leaks were of a major character, involving more than one vertical joint. They brought into use an earlier method of powder sealing than that described by Mr. Bird, similar in principle but less convenient in action because it involved the operator being on top of the hot retort, where he was not likely to add the powder in the small increments that were desirable. He preferred to put in 2 lb. at a time and then go away for 20 minutes. The new method, as shown in figs. 2 and 3 of the Paper, enabled the operator to sit comfortably in a cool position well away from the hot retort. After the first treatment the leaks were completely cured—in some cases after half an hour's treatment per retort. By the next scurfing period the 115 leaks had reappeared, leaving them with 28 still to be sealed. They were dealt with quite quickly and again put into action, and by the next scurfing cycle only seven leaks appeared; and after one more treatment all the leaks had been elininated. During the last scurfing cycle the coal gas leakage was measured by Dr. Pexton's method and found to be 5.5 therms per ton of coal. At that stage they did one more cycle of sealing, and then abandoned it because they had cured the leaks. They kept clear of the process for several months until leaks began to appear again, so they did another cycle and treated every retort whether it showed leakage or not, and at the end of the treatment their leakage had been reduced to 2.8. During the past winter they again temporarily abandoned the method because of shortage of labour. More leaks began to appear and all were cured except three, which were beyond the scope of the method, until in one case they were able to plug the retort from the chamber side, and by following that with powder sealing they again got a completely tight retort. The other two would be dealt with when the house went down this summer.

As recommended in the Paper, they did the sealing at temperatures of 1,150–1,200° or thereabouts, preferably higher than the normal scurfing temperature, otherwise they found it was not effective. The temperature was higher than that of the inner wall during carbonization, and it seemed a safeguard that the powder should melt at a higher temperature while the retort worked at a lower temperature. The method had been so effective in his case that he would like to thank the Author and his Company for having developed such an elegant and satisfactory way of increasing the tightness of retorts.

Mr. **Owen** (Slough) said the process had been carried out at High Wycombe for the last six months. A setting of 16 retorts put to work in November, 1944, were not sealed as a regular practice until February, 1945, but since then they had treated them at every scurfing period, and their results were as shown under Works "B." Referring to Works "A," it appeared that identical results were obtained by sealing after 36 hours' working, due presumably to the formation of scurf. It seemed, therefore, that the sealing process was more beneficial in the lower regions of the retorts.

Gillingham Results

Mr. D. **Woodall** (Rochester) said they had used one of the machines at their Gillingham works for the last six months. Their retort house consisted of six settings, four installed in 1916 and two in 1931, all settings of eight 40-in. retorts. Nos. 1 and 2 settings were reset last summer, and they had been treated after each scurfing ever since they were put to work. So far as he could make out the sealing had been entirely successful. There was no sign of leak in any of the retorts, and they could often build up to 5–6 in. pressure after a quarter of an hour's work with the machine. Nos. 3 and 4 settings were reset in 1942, and had now been at work three and a half years. When they first got the machine they were beginning to show signs of distress, but since using the powder they had been able to cure every one of the leaks in the retorts with the exception of one, which they hoped to deal with in the summer. They appeared to be keeping the retorts in exactly the same condition as they were six months ago, and from all appearances they would go considerably longer before resetting than they would otherwise have done. Nos. 5 and 6 settings were reset in 1941, and when they first got their machine they were in a very bad condition. With about six of the retorts they had not been able to do anything, and they were now out of use, but they had had some success with the red powder in the remainder of the retorts, and it had certainly enabled them to keep a larger number of retorts in action. He noticed that Mr. Bird recommended that new retorts should be airborne-sealed after each scurfing for the first year, and thereafter at intervals of three to six months, and the Chairman had mentioned that at Southend they were sealing only after every other scurfing. He felt there might be great advantages in airborne-sealing every retort after every scurfing.

Mr. **H. J. Randall** (Camberley) said they had experienced certain troubles with vertical retorts, but they had used the machine for nine months and their experience with it coincided with those of other speakers. So satisfied were they with it that the Chairman of his group of companies had placed an order for a number of the machines. Besides leaks in retorts they also had leaks in the castings, particularly at the bottom castings on verticals, from which it was a difficult matter to prevent leakage. Just recently they had experimented with metal spraying with the retorts in action. They had done this on eight retorts for two months and so far they were very satisfied.

Mr. **J. W. Townsend** (Tunbridge Wells), proposing a vote of thanks to the Author, said a very large number of people must be grateful to Mr. Bird and his Company for having developed the airborne sealing method.

Dr. **S. Pexton** (Gas Light and Coke Company), in seconding, said this very interesting system would no doubt be widely adopted. They looked forward to the time when they could take down some of the retorts that had been treated to make quite sure they were on the sound lines they thought they were.

The Author's Reply

Mr. **Bird,** in reply, said Mr. Shurrock's contribution represented a very interesting and valuable piece of research work on which ideas for the manufacture of the sealing compound might be developed. A different manufacturing technique was necessary to get the sealing powder so fine, and they would have to look into that very carefully. It had taken a long time to make the powder. They were making 2 cwt. a day on one machine, and it took two men working all their time, because the drying process was so slow and they had to be careful not to get too much volatile dust evolved. They had to work the manufacturing plant under vacuum because of the silicosis rules, and that delayed the process considerably. He would like to thank Mr. Rhead and Mr. Shorrocks for the work they had done, and would take an opportunity of going to see it. With regard to Mr. Green, he would content himself by saying that anything he said was always valuable, and was listened to eagerly; his encouragement was beyond what he had expected, because at times he had not always been so fulsome in encouraging manufacturers. In spite of his encouragement, they would persevere and not rest on their laurels too long. No opportunity of getting research carried out on the powder could be missed, and he would like to ask Mr. Green whether he could find space in his already crowded programme for immediate research on airborne sealing powder. From the refractory point of view he was interested in what Mr. Green had said with regard to adding to the durability of the retort. He appreciated Mr. Frank West's contribution. They looked upon him as an expert in the manufacture of refractories, and when he mentioned that the process might be extended to other industries he was speaking with considerable knowledge. A large percentage of the refractory materials he sent out went to industries outside the Gas Industry.

With regard to Mr. Wilson's remarks on wedge-shape holes in the retort, he suggested that these were related to the speed with which air was allowed to pass through, and a slight reduction in speed would probably have the desired effect. He was interested to hear of the success with which Dr. Haffner had sealed the retorts at Nine Elms. There must have been a nice financial saving as a result of reducing the losses from 5.5 to 2.8 therms, and he wondered what the Company was going to do with the money thus saved. They aimed at a softening point of 1,150–1,200°. The higher they got the safer they felt, and they were loth to bring it very much lower. The colour of the powder indicated the percentage of flux. Mr. Owen's retorts at High Wycombe were a picture of smoothness, and it would be a long time before they had an opportinity of seeing them taken down because they went on so effectively with the airborne sealing.

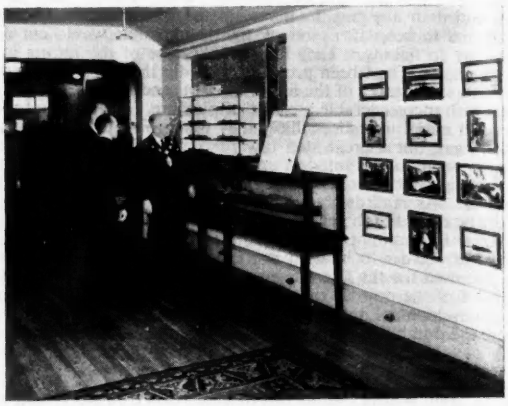
In answer to Mr. Woodall, he had suggested treatment every three months because one had to introduce the process gradually. If they advised treatment after every scurfing they might retard the system. He thought every three months was sufficient for the first year, but towards the end of the life of the retorts it should be done as often as was necessary. Mr. Randall's reference to the possibility of sealing castings by metal spraying was beyond the scope of the airborne sealing plant, but coupled with airborne sealing the method he had mentioned certainly looked like the right idea for extending the life of the plant.

Members of the Sheffield Branch of the Industrial Catering Association were entertained on April 9 to a programme of films, sponsored by the British Gas Industry, arranged for them by Mr. Ralph Halkett, General Manager and Chief Engineer of the Sheffield and District Gas Company in co-operation with Mr. L. A. Stapleton, of Edgar Allen & Co., Ltd., Hon. Secretary of the Sheffield Branch and North Region Area of the Industrial Catering Association. One of the films was "Planning your New Kitchen," and it was the first occasion on which this film had been shown in Yorkshire. The film tells how new and exciting kitchens have been planned for post-war homes, and describes to-morrow's kitchen, the kind of kitchen every woman wants. The other films included "It comes from coal," "Eating at work," and "Happy in the morning."

Exhibition at Epsom

The Ministry of Fuel and Power's mobile "Fuel and the Housewife" Exhibition, a pre-view of which was described in the "JOURNAL" of Mar. 13 (page 431), has just concluded a successful run at the Epsom showrooms of the Wandsworth and District Gas Company.

The exhibition was opened by the Mayor of Epsom, Councillor David Reid, J.P., supported by the Deputy Mayor and many Councillors and Borough Officials. The Ministry was represented by Sir Guy Nott-Bower, C.B., C.B.E., Joint Deputy Secretary, who said he was gratified to find that the Gas Company was prepared to stage an exhibition which included the appliances of other fuels, showing a proper appreciation of the domestic fuel problem. He quoted extracts from the Simon Report, and emphasized the fact that in pre-war days this country was the most wasteful in the world in the use of coal, and that we must now learn to use it both economically and intelligently in the home, so that the great demands of industry could be met. He pointed out that while the fuel situation was grave, it was not hopeless, and that the purpose of this exhibition was to encourage the development and use of the most economical appliances which would in the future be available to the public.



Colonel C. M. Croft, D.L., J.P., Managing Director of the Wandsworth and District Gas Company, in introducing the Mayor, referred to the fact that the occasion was unique inasmuch as electrical and solid fuel appliances were being displayed in a Gas Company's showroom, but he took the view that there was room for all fuels in the domestic life of the nation, and each had in appropriate circumstances its own particular advantage. Colonel Croft expressed regret that the Mayoress was unable to attend owing to illness, and later in the proceedings asked the Mayor to accept a bouquet on her behalf.

In declaring the Exhibition open, the Mayor referred to the pressing problems of domestic fuel, and was glad that Epsom should have the opportunity of presenting this exhibition in a showroom which was one of the features of their main street, and where one was always sure of a courteous and friendly reception.

The exhibits comprised three full-size kitchens devoted to electricity, gas, and solid fuel appliances, and displays of the latest methods of water heating. There was also a fine pictorial display, including models of the Gas Company's fleet of colliers and of the coal-discharging jetty at Wandsworth gas-works.

On the second day Miss Nancy Price, the eminent actress, was the principal speaker, when representatives of women's organizations visited the Exhibition. Major C. R. M. Croft and Mrs. Croft, on behalf of the Company, welcomed Miss Price and the guests. Mrs. Kemp and Mrs. Down, District Leaders of the Women's Voluntary Service, expressed appreciation to Miss Price for her talk, and Mr. Norman Auty, the Local Fuel Overseer, proposed a vote of thanks to the Company for giving the opportunity of an exhibition of this nature to be presented at Epsom.

Lawyer and Layman are equally served in *Town and Country Planning Law*, a new book by Eoin C. Mekie and Harold B. Williams. Its purpose is to provide instruction and advice for property owners, local authorities, industrial undertakings, and the legal profession, upon the various changes in existing laws brought about by the new Town and Country Planning Acts. Of the four sections into which it is divided, Part I deals with such subjects as planning authorities, acquisition of land by authorities, and compensation; Part II with Statutory Undertakers; Part III gives a comprehensive list of Acts and Regulations; while Part IV is in the form of an index to the first two sections. Of particular interest is the section devoted to war damage, which gives particulars of repairs, compensation, &c. The Gas Industry is accorded several pages. The book, which is published by E. & F. N. Spon, Ltd., and Eyre & Spottiswoode (Publishers), Ltd., costs 37s. 6d.

PRODUCTS PRICES

The London Market April 29.

There are no changes to report in the prices of Coal Tar products, the majority of which are controlled either by Government Order or by agreements.

The following are controlled by Government Orders at the prices indicated:—

Road tar at 5¼d. per gallon filled into buyers' tanks at sellers' works, with corresponding prices when delivered and when supplied in packages.

The price sprayed direct on to roads is controlled by agreement and is 8½d. per gallon for full tank loads in London and adjacent counties.

Creosote for hydrogenation is based on 5.875d. per gallon and creosote for timber preservation on 5½d. per gallon *ex* sellers' works, with the usual extras for different qualities, packages, &c.

The basic price for cresylic acid is 3s. 6d. to 5s. per gallon, according to grade.

Hot pressed naphthalene costs £11 11s. in bulk *ex* distillers' works. Prices for refined naphthalene vary from £20 15s. per ton for crystal on 50-ton contracts to £26 15s. per ton for ball and flake. These prices are delivered England and Wales in 2-cwt. bags, minimum 4-ton lots.

The maximum prices for coal tar naphtha vary from 1s. 11d. to 2s. 11d. per gallon and for xylol from 3s. 3½d. to 3s. 6d. per gallon delivered buyers' address in minimum 1,000-gallon lots in bulk. The maximum price for pure toluene is 3s. 2¼d. per gallon in bulk *ex* sellers' works.

The following prices are controlled by agreements:—

Pitch for briquetting is 70s. per ton *ex* sellers' works in bulk.

Phenol is 9¾d. to 11¼d. per lb. in large returnable drums delivered buyers' address, according to quantity.

The Provinces April 29.

The average prices of gas-works products during the week were: Pitch, 70s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6¾d. per gallon; pure, 3s. 2¼d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by S. R. & O. 1943, 1538, and for naphthalene by S. R. & O. 1944, 1051. Prices for road tar were increased by a half-penny per gallon by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

The bulk of the pitch produced in this country is required for home trade purposes but certain quantities are being sent at higher prices to Allied countries with the approval of the Coal Tar Control. So far as creosote is concerned the bulk is required for essential purposes, at controlled prices. With regard to hydrocarbon oils, the prices remain fixed, although there is more freedom than was previously the case.

Scotland April 27.

Market is active with prompt supplies still scarce. Refined tar*: Yield to the Distillers is 5d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6¼d. Hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7¼d. to 7½d.; benzole absorbing oil,* 6¼d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 7d. to 8d. per gallon. Solvent naphtha*: Basic maximum prices delivered in bulk, 90/160 grade, 2s. 10d., and 90/190 Heavy naphtha, Unrectified, 2s. 0½d.; Rectified, 2s. 4d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.

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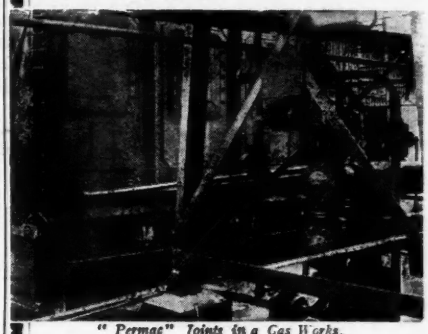
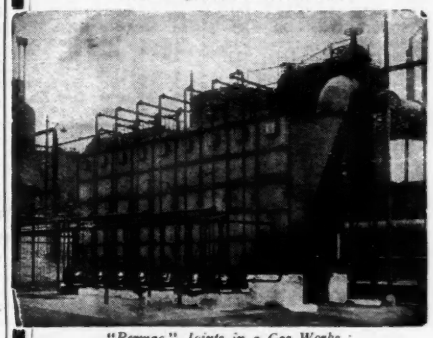
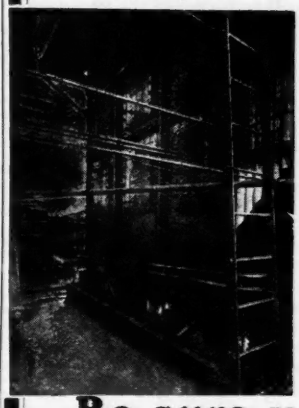


"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works



"Permac" Joints in a Gas Works

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GAS STOCKS AND SHARES

Stock Markets maintained the previous week's cheerfulness on the resumption of business after the holiday and there was a good turnover each day. British Funds were again very firm, but home rails reacted a little owing to the interest in other sections. O.F.S. shares went higher after the opening, reacting later on profit-taking, and in the industrial section Cables and Wireless fluctuated sharply on the terms of the Bill.

There was more activity among gas stocks and shares than for some time past, but despite this the majority of prices were unaltered. A great deal of the business centred round Imperial Continental, which rose 5 points to 125½, a gain of 12 during the month. Another strong feature was Oriental, which closed 9½ higher at 223. The prices in the lists below compared with a month ago show fewer changes than usual, the features being the sharp rises in Bombay, Imperial Continental, and Oriental stocks, while Gas Light 3½% maximum stock gained 4.

The following quotations were changed last week:

OFFICIAL LIST

Commercial 5 p.c. Deb.	113—118	+2
Croydon Sliding Scale	120—125	+1
Gas Light 3½ p.c. Red. Pref.... ...	100—103	+1
Imperial Continental Ord.	123—128	+5
Oriental	218—228	+9½
Primitiva Holdings Ord.	12/6—13/6	—/6d.
South Metropolitan	92—95	+½

Quotations on the London and Provincial Stock Exchanges

OFFICIAL LIST

Issue. £	When ex-Dividend.	Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual.	Last Hf. Yr. Actual.	NAME.	Quotations April 25
1,767,439	March 11	30/-	40/-	Alliance & Dublin Ord. ...	123—127
900,018	Oct. 29	6d.	6d.	Assed. Gas & Water U'd'ts Ord.	19/9—20/9
389,000	"	7½d.	7½d.	Do. Deferred	20/—21/-
500,000	March 11	2½	2½	Do. 4½ p.c. Red. Cum. Pref.	19/6—21/6
536,000	"	2	2	Do. 4 p.c. Red. Cum Pref.	19/—20/-
342,000	"	2	2	Do. 4 p.c. Irred. Cum. Pref.	19/—20/-
561,370	Feb. 18	70/-	70/-	Barnet Ord. 7 p.c.	156—161
300 000	Oct. 8	10½d.	8½d.	Bombay, Ltd.	43/—45/-
690,526	Feb. 11	70/-	70/-	Bournemouth 7 p.c. max. ...	153—158
362,025	Dec. 17	2	2	Do. 4 p.c. Deb. ...	102—107
659,955	March 4	41/-	50/-	Brighton, &c., 5 p.c. Con. ...	107—112
855,000	" 11	60/-	90/-	Brit. Gas Light Ord.	122—127
545,000	Dec. 17	2½	2½	Do. 5½ p.c. 'B' Cum. Pref.	112—117
120,000	"	2	2	Do. 4 p.c. Red. Deb.	95—100
100,000	April 23	2½	2½	Cape Town, Ltd., 4½ p.c. Cu. Pf.	13'—15/-
626,860	Feb. 11	50/-	70/-	Cardiff Con. Ord.	120—125
24,500	Nov. 12	8½d.	8½d.	Colombo 7 p.c. Pref.	23/6—25/6
764,169	April 1	6d.	6d.	Colonial Gas Assn. Ltd. Ord. ..	17/—19/-
400,000	"	9½d.	9½d.	Do 8 p.c. Pref. ...	23/—25/-
1,748,090	Feb. 25	—	40/-†	Commercial Ord.	64—67
620,000	Dec. 10	1½	1½	Do. 3 p.c. Deb.	82—87
286,344	Feb 18	2½	2½	Do. 5 p.c. Deb.	113—118
807,560	"	60/-	60/-	Croydon sliding scale	120—125
644,590	"	50/-	50/-	Do. max. div.	102—107
620,385	Dec. 31	2½	2½	Do. 5 p.c. Perp. Deb. ...	117—122
179,500	Feb. 18	50/-	50/-	East Surrey 'B,' 5 p.c. ...	101—106
176,461	Dec. 27	2½	2½	Do. 5 p.c. Deb. (Irred.)...	117—122
239,135	Nov. 12	7½d.	6d.	Gas Consolidation Ord. 'A' ...	20/—22/-
250 000	"	4½	4½	Do. Ord. 'B' ...	19/—21/-
250,000	"	2	2	Do. 4 p.c. Red. Cum. Pref.	18/6—20/6
19,101,877	Feb. 18	6d.	6d.	Gas Light & Coke Ord. ...	21/6—22/6a
2,600,000	"	35/-	35/-	Do. 3½ p.c. max.	88—91
4,477,106	"	2	2	Do. 4 p.c. Con. Pref. ...	100—103
2,993,000	Dec. 31	1½	1½	Do. 3½ p.c. Red. Pref. ...	100—103
8,602,497	" 3	1½	1½	Do. 3 p.c. Con. Deb. ...	92—95
3,642,770	"	2½	2½	Do. 5 p.c. Red. Deb. ...	106—109
3,500,000	"	2½	2½	Do. 4½ p.c. Red. Deb. ...	106—109
700,000	March 18	1½	1½	Do. 3½ Red. Deb. ...	97½—99½
5,600,000	May 28	—	†£10	Imperial Continental Cap. ...	123—128
43,340	Jan. 28	1½	1½	Do. 3½ p.c. Red. Deb. ...	99—102
2,167,410	Feb. 11	60/-	55/-	Liverpool Ord.	113—116
231,978	" 18	50/-	50/-	M.S. Utility 'C' Cons.	101—106
918,657	"	2	2	4 p.c. Cons. Pref.	100—103
675,000	Nov. 12	‡40/-	‡40/-	Montevideo, Ltd.	116—121
300,000	Dec. 10	£4	£6	Oriental, Ltd.	218—228
368,537	"	57/6	50/-	Plymouth & Stonehouse 5 p.c.	108—113
621,667	Feb. 11	72/6	72/6	Portsmouth & Gosport Cons.	145—150
2,386,371	July 9	†9½d.	†9½d.	Primitiva Holdings, Ltd. Ord.	12/6—13/6
226,860	Dec. 10	3	3	Do. 6½ p.c. Red. Cum. Pref.	100—105
648,999	Sept. 10	6½	6½	Severn Val. Gas Cor. Ld. Ord.	20/6—22/6
597,972	March 11	2½	2½	Do. 4½ p.c. Cum. Pref. ...	20/—22/-
2,528,714	Aug. 27	6d.	3½d.	South East'n Gas Cn. Ld. Ord.	19/6—20/6
1,000,000	Feb. 25	2½	2½	Do. 4½ p.c. Red. Cum. Pref.	19/6—21/6
1,068,869	"	2	2	Do 4 p.c. Irred. Cum. Pref.	19/6—20/6
6,709,895	" 11	30/-	50/-	South Met. Ord.	92—95
1,135,812	"	3	3	Do. 6 p.c. Irred. Pref. ...	122—127
850,000	"	2	2	Do. 4 p.c. Irred. Pref. ...	98—102
1,895,445	Dec. 31	1½	1½	Do. 3 p.c. Perp. Deb. ...	88—91
1,000,000	Jan. 14	2½	2½	Do. 5 p.c. Red. Deb. ...	101—106
1,543,795	Feb. 4	50/-	50/-	South Suburban Ord. 5 p.c ...	107—112
512,825	"	2½	2½	Do. 5 p.c. Perp. Pref. ...	109—114
500,000	"	2	2	Do. 4 p.c. Perp. Pref. ...	98—103
250,000	"	1½	1½	Do. 3½ p.c. Red. Pref. ...	97—102
888,587	Dec. 10	2½	2½	Do. 5 p.c. Perp. Deb. ...	117—122
750,541	Feb. 11	50/-	50/-	Southampton Ord.	104—109
350,000	"	2½	2½	Swansea 5½ p.c. Red. Pref. ...	103—108
1,076,490	March 4	50/-	50/-	Tottenham & District Ord. ...	107—112
338,555	"	2½	2½	Do. 5 p.c. Pref.	107—112
453,380	Dec. 10	2	2	Do. 4 p.c. Perp. Deb. ...	100—105
1,483,664	Nov. 12	7½d.	6d.	U. Kingdom Gas Cor. Ord. ...	20/6—21/6
1,085,952	"	5½d.	5½d.	Do. 4½ p.c. 1st Cum. Pref. ...	20/6—22/6
772,709	"	4½d.	4½d.	Do. 4 p.c. 1st Red. Cum.Pref.	20/—21/-
745,263	Dec. 17	5½d.	5½d.	Do. 4½ p.c. 2nd Non.Cum. Pf.	19/—21/-
1,200,000	March 18	1½	1½	Do. 3½ p.c. Red. Deb. ...	97—102
380,606	Aug. 13	66/3	66/3	Uxbridge, &c., 5 p.c.	125—130
1,371,138	Feb. 18	50/-	50/-	Wandsworth Consolidated ...	107—112
2,525,768	"	2	2	Do. 4 p.c. Pref.	100—103
1,343,964	Dec. 17	2½	2½	Do. 5 p.c. Deb.	118—123
383,745	"	2	2	Do. 4 p.c. Deb.	100—105
558,342	Feb. 18	50/-	50/-	Watford & St. Albans Ord. ...	108—113

SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual.	Last Hf. Yr Actual.	NAME.	Quotations April 25
351,685	Dec. 17	2½	2½	Brighton, &c., 5 p.c. Perp. Deb.	117—123
415,250	"	2	2	Bristol Gas Co., 4 p.c. New Deb.	101—104
140,205	Feb. 11	70/-	70/-	Cambridge, &c., 7 p.c. Cons. 'B'	135—140
295,932	March 18	50/-	50/-	Cheltenham, 5 p.c. Cons.Ord....	105—110
42,500	Dec. 17	2	2	Do. 4 p.c. Perp. Deb....	98—103
150,000	Feb. 25	2	2	Croydon Gas, 4 p.c. Pref. (Irr.)	97—102
130,000	Dec. 31	2	2	Do. 4 p.c. Deb ...	100—105
53,220	Feb. 18	3	3	East Surrey, 6 p.c. Cum. Pref....	122—127
198,000	March 25	—	70/-	Eastbourne, 'B' 3½ p.c.... ...	98—103
117,425	Feb. 25	—	6⅔†	East Wight Cons. 5 p.c.	107—112
156,600	Feb. 18	50/-	50/-	Hampton C't, 5 p.c. Cons. Ord.	107—112
18,000	April 1	7†	3½	Malta & Mad'n., 7 p.c. 1st Pref.	95—105
50,000	Feb. 18	52/3	52/3	Mid. South. Util., 'A' Cons. 5 p.c.	105—110
73,380	Dec. 17	2½	2½	Newport (Mon.), 5 p.c. Deb...	115—120
65,000	Aug. 13	2½	2½	North Middlesex, 5 p.c. Pref....	107—112
70,000	March 11	2½	2½	Plymouth & Stone., 5 p.c. Deb.	115—120
76,501	Dec. 17	2	2	Reading, 4 p.c. Perp. Deb. ...	97—102
74,777	Oct. 1	2	2	Romford, 4 p.c. Debs. (Reg.) ...	98—103
363,575	Jan. 2	2½	2½	Tottenham, 5 p.c. Reg. Red. Mt.	98—101
202,019	Sept 24	75/-	75/-	Tunbridge Wells, 4 p.c. Scale ...	137—142
135,257	Dec. 3	2½	2½	Uxbridge &c., 5 p.c. Perp. Deb.	118—123

PROVINCIAL EXCHANGES

					Quotations April 18
804,948	March 4	2½	2½	Bath Cons.	112—114
122,577	Feb. 18	3	4	Blyth 5 p.c. Ord.	122—124
1,667,250	" 11	2½	2½	Bristol, 5 p.c. max.	115—117
120,420	Dec. 17	2	2	Do. 1st 4 p.c. Deb.	102½—104½
415.250	"	2	2	Do. 2nd 4 p.c. Deb. ...	101½—103½
3 28,790	"	2½	2½	Do. 5 p.c. Deb.	119—121
157,150	Feb. 4	2½	3½	Chester 5 p.c. Ord.	114—116
52,500	Dec. 17	2	2	Do, 4 p.c. Cum. Pref. ...	98—100
40,000	"	2	2	Do. 4 p.c. Non. Cum. Pref.	98—100
36,430	"	1½	1½	Do. 3½ p.c. Deb.	87—91
41,890	"	2	2	Do. 4 p.c. Red. Deb. ...	99—101
542,270	Feb. 11	3	4½	Derby Cons.	132—137
55,000	Dec. 17	2	2	Do. 4 p.c. Deb.	97—102
40,000	Feb. 18	5½	5½	Exeter 10 p.c.	185—195
10,000	"	5	5	Great Grimsby 'A' Ord. ...	185—195
6,500	"	5	5	Do. 'B' Ord. ...	185—195
79,000	"	5		Do. 'C' Ord. ...	175—185
732,000	"	2	2½	Hartlepool G. & W. Cn. & New	99½—101½
490,681	Dec. 17	1½	1½	Liverpool 3½ p.c. Red. Deb. Stk.	95—100
245,500	"	2	2	Do. 4 p.c. Red. Deb. Stk.	102—104
306,083	Dec. 31	2	2	Do. 4 p.c. Deb.	101—103
680,000	Nov. 28	2½	2½	Do. 5 p.c. Red. Stk. ...	104—109
20,000	Dec. 17	2½	2½	Long Eaton 5 p.c. Pref.	9—11
80,000	"	2½	2½	Do. 5 p.c. Deb.	117—122
2,430,267	Feb. 11	2½	2½	Newcastle and Gateshead Con.	23/9—24/3a
682,856	"	2	2	Do. 4 p.c. Pref.	101—103
776,706	Dec. 27	1½	1½	Do. 3½ p.c. Deb.	98—100
250,000	"	1½	1½	Do. 3½ p.c. Red. Deb. ...	99—101
73,186	Oct. 29	2	2	Do. 4 p.c. Red. Deb. ...	102—104
106,280	Feb. 4	5	5	Preston 'A' 10 p.c.	188—193
188,219	"	3½	3½	Do. 'B' 7 p.c.	144—149
1,806,339	Feb. 28	3½	3½	Sheffield Cons.	128—133
95,000	Jan. 7	2	2	Do. 4 p.c. Deb.	98—102
332,351	Feb 4	3	3	Sunderland 6 p.c. max. ...	122½—124½
192,150	" 11	2½	2½	Weston-super-Mare Cons. ...	112—114
64,338	Dec. 31	2	2	Do. 4 p.c. Deb.	99—101
33,340	"	3½	3½	Do. 7½ p.c. Deb.	145—150

a —The quotation is per £1 of Stock. * Ex. div. † For year. ‡ Paid free of Income-tax.

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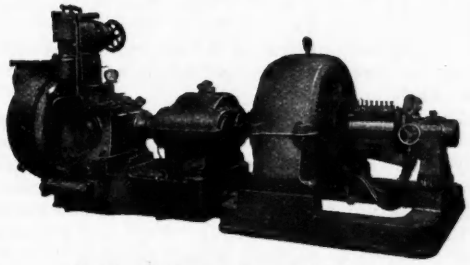

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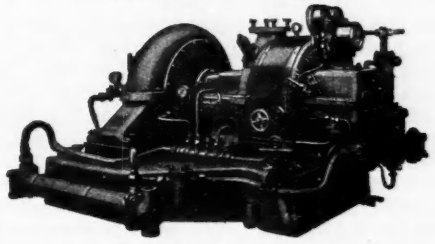

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